Proceedings of

THE PRESIDENT'S CONFERENCE on OCCUPATIONAL SAFETY

June 23, 24, 25, 1964

Washington, D.C.

U.S. DEPARTMENT OF LABOR

Bureau of Labor Standards

BULLETIN 263

THE WHITE HOUSE

Washington

April 7, 1964

JOB SAFETY WEEK

THE loss in skill and earning power of every man and woman who suffers a preventable work injury impoverishes still more a Nation already at war against poverty. We must prevent this flank attack on our progress in enriching the skills and extending job opportunities for all our people.

To devise voluntary action to reduce the human and economic waste of needless work injuries, leaders of American business, labor, agriculture, science, government and safety organizations will convene in Washington for the President's Conference on Occupational Safety.

To enlist the natural leadership in each worker, farmer, teacher or businessman, I have designated the Conference week of June 21–27 as Job Safety Week.

I call upon every American to work safely and to safeguard his fellow workers. I am confident a week's trial will commend the practice of safety all year round.

I urge Governors and Mayors to use their good offices in their own States and communities to invoke the leadership of every employer and worker to protect the lives, limbs and skills of all who toil.

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U.S. DEPARTMENT OF LABOR

W. Willard Wirtz, Secretary

BUREAU OF LABOR STANDARDS

Nelson M. Bortz, Director

AMONG THE services it renders to the President's Conference on Occupational Safety, the U.S. Department of Labor issues this bulletin as the official record of the 1964 meeting. In this document will be found the Report to the President and the Nation—comprising the Conference conclusions—together with the major addresses and presentations of panelists and speakers at the several Conference Workshops. The views expressed herein represent those of the program participants in the subject areas to which they addressed themselves.

U.S. DEPARTMENT OF LABOR
Bureau of Labor Standards
Washington

Attached is a copy of the Proceedings of the Ninth Biennial President's Conference on Occupational Safety, held in Washington last June. The volume contains the Conference's Report to the President and the texts of major addresses, technical papers, and statements of participants in the programs of workshops and plenary sessions. As Secretariat to the Conference, the Bureau of Labor Standards prepares this report following each Conference. It is sent to all delegates of record and to those who have asked to receive a copy.

Readers will find the Conference theme "Mobilizing Leadership for a Safety Breakthrough," reflected throughout. The Conference particularly sought to focus national attention on industries where growth in employment and hence in exposure to job hazards is expected in the next decade; to detect the occupations and environment where rapid technological change is increasing hazards or shifting them from one operation to another; and voluntarily to devise and apply effective safeguards therefor.

Discussions covered the safety of workers in the health services, research and development activities, construction, government at all levels, agriculture, trades and services, and manufacturing. Human aspects of the accident barrier were discussed by eminent authorities, as were safety in occupational training, and off-the-job. The safe design of structures, equipment and layout; hazard controls for the working and living environments; and the importance and use of accident records, accident costs, and safety standards to further the protection of workers were also among the topics covered.

Some 100 program speakers and panelists, representing a cross section of economic, scientific, and professional leadership, took part in the Conference program to devise voluntary action to reduce the Nation's toll of work deaths and injuries.

Following the 1964 Conference, a number of delegates wrote to the Department and explained their plans for using information they had acquired during the sessions. We hope that you, too, will find ways to apply some of the many techniques suggested and to further the recommendations made.

... and public employment. The importance of safety in occupational training, trades and services, the design of

Foreword

LEADERSHIP as the key factor in job safety progress set the tone, while swift-moving developments in technology and in the work force set the tempo of the 1964 President's Conference on Occupational Safety, held in Washington, June 23–25. In all, nearly 3,000 organizational leaders, representing every facet of American life and from all parts of the Nation, took part in the 2½-day session which marked the ninth biennial gathering of this Presidential forum to devise voluntary methods of safeguarding the workers of America.

The Conference began to take shape in April of 1963 when President Kennedy called two men to the White House—Reed O. Hunt, Chairman of the Board, Crown Zellerbach Corporation, and Leo Teplow, Vice President, Industrial Relations and Public Affairs, American Iron and Steel Corporation. He asked both to assist their Government "and specifically the Department of Labor" as executive director and program chairman, respectively, of the Conference. With the assistance of Hunter P. Wharton, President, International Association of Operating Engineers, as program vice chairman, and a 40-member advisory committee to the Secretary of Labor, General Conference Chairman, planning started.

Soon after Mr. Kennedy's assassination, President Johnson directed the Secretary of Labor to continue Conference plans under way. "The loss in skill and earning power of every man and woman who suffers a preventable work injury impoverishes still more a Nation already at war against poverty. We must prevent this flank attack on our progress in enriching the skills and extending job opportunities for all our people," he said. At the same time he urged Governors and Mayors to use their good offices in their own States and communities to invoke the leadership of every employer and worker to protect the lives, limbs and skills of all who toil.

The Conference program dealt with safety specifics on subjects ranging from industries like agriculture, construction, and manufacturing; through such "tool" areas as accident records, costs, and standards; to safety of workers in the expanding fields of health services, research and development, and public employment. The importance of safety in occupational training, trades and services, the design of

facilities, control of environmental hazards, as well as off-the-job, were also included. Three world-renowned scientists presented an interdisciplinary view of what the life sciences are disclosing about human factors that influence safety. In addition to program participants from this country, speakers also came, for the first time, from Canada, the United Kingdom, and Switzerland.

These proceedings contain a record of the major speeches and presentations made during the various sessions. Regrettably, there are a few omissions because it has been impossible to obtain the authors' texts. However, because of the quality of the statements included and the eminence of the Conference speakers in their various specialties, it is felt that this official record of the Conference constitutes a valuable reference for present and future use. Taken in conjunction with published reports of earlier President's Conferences, they provide a penetrating view of problems, and efforts to solve them, as well as trends in occupational safety in this country.

In his summation of the 1964 Conference, the Secretary of Labor commented: "To read these papers is to be particularly interested in how the study and the discussion of this Conference has progressed from the specific areas of accident prevention to the broader considerations of the human aspects of the accident barrier. You have moved from a study of how to control the physical elements of our environment on to the thoughts of dangers inherent in emotional stress, the hazards of human communication, and the difficulties of motivation. You have considered the danger of somebody stubbing his toe; you have also considered the danger of somebody stubbing his tongue, You have recognized that a man can slip a disc because first something slipped his mind. And you have pointed out that you can lose a limb because you first lose your temper. Inevitably, the specific concern of this Conference has been how to protect man from an increasingly perilous environment, but that has forced you on to a consideration of broad issues. * * *"

The U.S. Department of Labor is indebted to the 200 men and women, leaders in both public and private organizations, who took an active part in advising the Department on Conference planning, assisted in organizing workshops, and participated in the program. Appreciation is also extended to the Conference delegates, many of whom came from great distances at their own, or their organizations' expense, to participate in the discussions and who will ultimately put into practice the recommendations made by this Conference.

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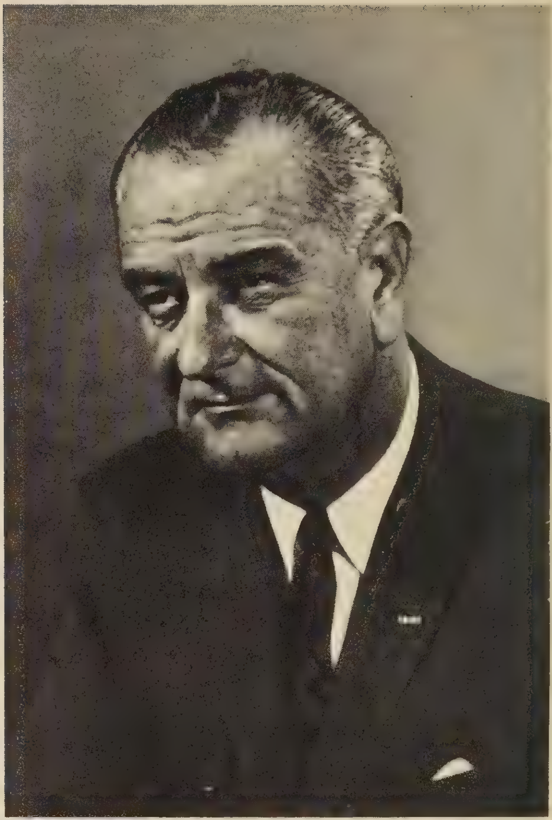

President
Lyndon B. Johnson

Secretary of Labor
W. Willard Wirtz

The President's Conference on Occupational Safety

The President's Conference on Occupational Safety was convened in a 3-day session on the morning of June 23, 1964, in Constitution Hall, Washington. The Honorable W. Willard Wirtz, Secretary of Labor, presided as chairman of this, the ninth biennial Conference session.

The Invocation was offered by Rear Adm. J. Floyd Dreith, Chairman of the Armed Forces Chaplains Board.

The presiding officer paid tribute to the U.S. Marine Band and to its Director, Lt. Col. Albert Schoepper, USMC. He then welcomed delegates and introduced the first speaker:

Presiding Officer: This is a long 2½ days' Conference. We will start the sessions as closely as we can, and we will catch up wherever it is necessary, particularly this morning, because we are working on a very close schedule, so my remarks of welcome will be very brief. They would be only an expression for each of you and all of the others here that a meeting of this kind can be held, if you will, in this country by common consent and by common participation. Nobody is here because he has to be. Everybody is here because of the interest in being here and that interest centers around the welfare of a people, that of an ennobled body, and one which it gives us great pride to recognize here this morning.

I speak only very briefly to the participation of a hundred of the leaders of this interest in safety who have been responsible for this program, leaders from management, from labor, from agriculture, from Government, who have brought to bear on the organization of

this program with their very special interest in it. We are grateful to all who have participated in the planning of this program and in the arrangements for it.

We turn first in our program to the man who has really been the field general of this Conference, who organized it, who has, with the help of the small executive committee with which he has worked, brought it into final focus, and who will speak to us now about the proceedings of the next 2½ days.

Our Conference theme centers around the idea and concept of leadership in the occupational safety areas. Mr. Hunt is a man whose company has taken leadership in this field, which has reduced its injury-frequency rate 86 percent in the last 16 years, despite the fact of a 50-percent increase in employment over that period, a man who, as president of his company but also as a leader in this movement, has brought to the American public a renewed interest, a heightened interest, in the whole concept of occupational safety. Mr. Reed O. Hunt, Chairman of the Board of the Crown Zellerbach Corporation.

Accent on Leadership

REED O. HUNT, *Executive Director, President's Conference on Occupational Safety; Chairman of the Board, Crown Zellerbach Corp.*

It is a great privilege and honor to open this—the ninth—President's Conference on Occupational Safety . . .

I see many "repeaters," too. Not accident repeaters, but "safety repeaters." Hundreds of you who, having come here before—perhaps many times—are back again for more.

You have noted, of course, the theme for this year's Conference, "Mobilizing Leadership for a Safety Breakthrough." In a very real sense, "leadership" has been the theme of the President's Conference throughout its 15 years of activity. Back in September 1948, the President of the United States sent a message to the first organizational meeting, then in session. In that message, President Truman said:

> ". . . Maintenance of our position of *world leadership* and our own standard of living depends upon full production. . . . Human lives can be saved by instilling *your leadership* and skill in the daily practice of employers and workers at every workbench and at every job site in the country. . . ."

The bedrock truth embodied in these words is just as valid and meaningful today as in 1948.

The President's Conference on Occupational Safety typifies and is a tangible expression of the leadership of our Presidents—Truman, Eisenhower, Kennedy, and Johnson—in this very human sector of national concern that we call job safety.

Nearly 15 months ago, in April 1963, when President Kennedy called us to the White House to discuss plans for this 1964 Conference, he

stressed first of all the personal, individual tragedies suffered by accident victims and their families.

More than ever, the United States needs safety leadership. I would be among the last to minimize or downgrade the splendid work that has been done—especially during the past half century—and is now being done, by the legion of dedicated men and women who are the shock troops of the organized safety movement in this country. Their efforts have been Herculean, their results notable, and their rewards, unfortunately, rather meager at times. Yet we must be realistic. Despite all the progress in preventing job injuries—and it has been real progress—we seem to have been spinning our wheels for the past decade or so. It has been suggested that the downward curve of our job injury experience has leveled off on a "safety plateau" to which it clings tenaciously, resisting all efforts to dislodge it.

"But," you might say, "look how many more people are at work. Even though the number of deaths and injuries hasn't changed much, employment—and hence, exposure—is much greater. Operations are more complex; machines run faster; everything moves at a higher pace."

Or you may say, "Consider the *rates*, and you'll see we haven't been doing too badly." And so on.

I suggest it's time for safety people to abandon this rationale of our alleged progress in safety. It looks as if our job injuries actually inched up a bit higher last year. We must not let this become the start of an upward trend. As many of you know, last year saw disabling work injuries in the United States rise to two million twenty thousand, after holding below the 2-million mark for 10 years. Fatalities jumped 3.6 percent—from 13,700 to 14,200.

More important than rates, graphs, percentages, and so forth, I think, is the fact that over 2 million American workers were disabled, nearly 85,000 of them with some permanent impairment, and 14,200 were killed as a result of job accidents in 1963. By any standard this is too many. It is the challenge we in the safety movement face: to *mobilize leadership for a safety breakthrough.* It is a challenge worthy of our best efforts.

You are here because you are leaders. All of you. It is erroneous to think that leadership is exclusively a prerogative and a responsibility of the top echelon in an organization or group. True leadership goes all the way up and down the line. Each of us here today is in a position to exert safety leadership.

Because you are leaders, each one in his own particular province, be it industry, labor, business, government, agriculture, education, science, and so on—your responsibility—your obligation—is great. Safety cannot be brought about by conferences. Action is needed, and

action needs leadership. This compelling need for continuous, ongoing leadership for safety reflects, we think, one of the basic purposes of the President's Conference on Occupational Safety: namely, to inspire, to focus, to stimulate, and to assist leadership, thus promoting action through voluntary, cooperative means.

The Program Planning Committee—under the guidance and leadership of Mr. Leo Teplow and Mr. Hunter Wharton—has developed an agenda for this 1964 Conference keyed to the leadership theme. It recognizes two major factors present in today's dynamic, shifting world of work:

1. The increasing size and the changing composition of the Nation's work force; and
2. Accelerating technological advances that may be spawning new hazards at the same time that they are reducing certain older dangers.

Together, these two elements—work force changes and technological changes—call for extensive re-thinking of the whole problem of occupational safety.

Technological progress has given industry another important tool in the effort to reduce accidents and injuries. But like any tool, for greatest efficiency it must be utilized in conjunction with equally modern training and safety programs. This is a task that calls for leadership of the highest order.

Now, as to the specifics of the next two and a half days and the agenda prepared by the Conference planners. From the official program you will note that the President of the United States will speak to us at noon today. President Johnson has demonstrated his vital concern for preventing the human tragedies and economic losses that inevitably follow accidental injuries. One of his early decisions as Chief Executive was to continue the plans for this Conference begun by the late President Kennedy. Many of you will recall that as Vice President, Mr. Johnson represented Mr. Kennedy on this platform at the opening session of the 1962 President's Conference. I know that the President, as the Nation's leader, will bring us a message on leadership that will be both challenging and inspiring.

This morning we shall have the added privilege of hearing from Dr. Detlev W. Bronk of the Rockefeller Institute, who will share with us his thoughts on "The Humane Values of an Industrial Civilization."

The Technical Advisory Committee, during the early stages of program planning, suggested increasing the number of workshops. This is an attempt to direct specific attention to those industries and occupations where greater exposure to hazards is expected because of increasing employment, or technological change, or both. These include: Health Workers, Construction, Public Employees, Workers

in Research and Development, in Trades and Services, and in Manufacturing. In addition, a number of "tool" workshops were suggested for developing safety techniques applicable across-the-board, and not just to one industry or group of industries. These workshops are: Accident Records, Accident Costs, Standards, Safety Through Design, Control of Environmental Hazards, and Off-the-Job Safety.

These 12 workshops of half a day each—50 percent more than in previous years—will give all of you a greater variety and wider choice. Four workshops will be held this afternoon, four tomorrow (Wednesday) morning, and four tomorrow afternoon. A special session on Agricultural Safety will run all day tomorrow. These workshops will be held in different downtown auditoriums—all air-conditioned—and at the times shown in the official program. We hope you will attend the sessions of your choice.

A plenary session on Safety Education will be held at 8 o'clock this evening in the Departmental Auditorium (also air-conditioned). Here, the educators and training people from our school system, from industry, labor, and the public will seek practical ways of "Mobilizing Leadership for a Safety Breakthrough in Occupational Training."

The human element—ever present in safety—is the subject to be covered in the closing plenary session Thursday morning. You will note that we have departed from the previous practice of holding the final session in the Departmental Auditorium. Because of very heavy advanced registration, it will be held here in Constitution Hall, as announced in the official program. This session, which will surely be a highlight of the 1964 Conference, includes a panel of three world-renowed scientists who will show how leadership can be applied in coping with the "Human Aspects of the Accident Barrier." After they present their papers, the scientists will be "quizzed" by an industrialist and a labor leader.

An international flavor will be added to the closing session by Mr. William M. Larke, a British iron and steel executive and longtime student of safety, who will compare and contrast the safety philosophies and approaches to accident prevention in the United States and the United Kingdom.

Secretary of Labor Wirtz will address the closing session with a summation of the safety challenge which now faces us—the theme of our 1964 Conference. The Conference Report to the President will also be presented at this final session.

So much for the scheduled events. During the decade and a half since the President's Conference was initiated, there have evolved a few guidelines or benchmarks whose observance will help assure a successful, smooth-running Conference.

1. The role of the Federal Government is to exercise leadership through identifying and emphasizing the Nation's interest and concern in safeguarding all who work, thus conserving their skills, preventing suffering, and reducing waste. In addition, it provides technical information and assistance to those responsible for accident prevention.
2. The President's Conference is not an operating agency. Its twin objectives are to help people obtain facts and to provide a source of inspiration and stimulus for action. A longstanding Conference policy precludes endorsement of, or opposition to, specific legislation.
3. The Conference operates on the consensus principle; hence it neither takes formal votes nor does it adopt formal resolutions.
4. The final Conference report will be a composite of the reports of the various workshops, including such minority views as may arise. This report is not only a report to the President of the United States; it is a report to the Nation from those upon whom rests the responsibility for safeguarding the Nation's work force and conserving its manpower resources.
5. Recognizing the mutual advantages of audience participation, we invite it wherever and whenever it contributes to the common good. Obviously, it is impracticable in the plenary sessions—such as this one—with large attendance and a tight schedule. However, the 12 workshops and the special sessions all provide opportunity for you to take part. We hope you will.
6. The official proceedings will include essential papers as well as the Conference conclusions, and copies will be mailed to all registered delegates as a matter of course.
7. For additional information, I suggest you consult the official program. If you don't find the answer there, you can get it from the information desk in the lobby of the Departmental Auditorium beginning this afternoon.

Finally, some of you may be wondering, "What can we expect from this Conference?" My answer is, "You will get out of it just as much as you put into it." The program has brought together a vast wealth of know-how and expertise; the speakers and panelists are top men and women in their fields. All of us can learn—if we will—much that is of value from the contacts, formal and informal, we will be making during these two and a half days. In closing, I'd like to repeat part of Mr. Teplow's answer to a question asked by a delegate in 1962 as to how the value of such a Conference as this can be appraised. It was this: "If we have brought to you knowledgeable people . . . if the utilization of the great office of the President of

the United States to raise the level of importance of the safety function has been useful—if you have gathered . . . some pointers, or nothing more than inspiration to do a better job than in the past—then the Conference has been worthwhile."

Presiding Officer. Thank you. We turn now to the introduction of our discussion, the subject matter of this two and a half days, reckoning right at the start with the toughest problem that we can face. We are all aware, to various degrees of concreteness, of the challenge in this day of rampant and sometimes reckless technology, a challenge to the establishment of social values which will keep up with the mechanical and technological and scientific progress which is so much a sign of our times. We are none of us unaware of the fact that we are going to live the rest of our lives just one spark away from complete destruction, and the logic of the situation is sometimes not quite clear to us. We are all aware that in numbers, of a democratic society characterized by decentralized decision-making in which we all take part, we will, from here on out, know less and less about more and more the things we have to decide. We are all aware of the increasing gap between the knowledge of a few of us and the understanding of the rest of us, and we are all wondering how, in a society built around the concept of the preservation of the magnificence of the individual, we can preserve that magnificence of the individual in a situation in which the industrial society is making each of us, each individual, each day, more dependent upon all other individuals.

It is for these reasons that the planners of this meeting have chosen to start it with a square facing up to the question of the establishment and the preservation of humane values in an industrial civilization. It would have been impossible to bring to this subject a man more completely qualified in every way to discuss it than Dr. Bronk, a man who comes from a wealth of academic experience, but also from an experience which has included the possibility and the opportunity to apply knowledge so that it becomes understanding; a philosophically minded scientist, a man who better than any of us has bridged the gap between the two worlds; a graduate of Swarthmore College, a Ph. D. from the University of Michigan; teacher, president, then, of Johns Hopkins University from 1948 to 1953; Chairman of the National Science Foundation; presently president of the Rockefeller Institute. And much of what he has done is summarized in the citation which he recently received when he was given the Public Welfare Medal of the National Academy of Sciences for his "eminence in the application of science to the public welfare."

We are grateful to you, Dr. Detlev W. Bronk, for your being here this morning.

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The Humane Values of an Industrial Civilization

DR. DETLEV W. BRONK, *President, Rockefeller Institute*

Mr. Secretary, Mr. Hunt, Mr. Teplow, Ladies and Gentlemen. On this morning when we are to have the privilege of hearing the President of the United States I am reminded of words he recently uttered at the Holy Cross commencement which are pertinent to what I wish to speak of this morning. Said President Johnson on that occasion, "Even if we end terror and even if we eliminate tension, even if we reduce arms and restrict conflict, even if peace were to come to the Nations, we would turn from this struggle only to find ourselves on a new battleground as filled with danger and as fraught with difficulty as any ever faced by man. For many of our most urgent problems do not spring from the cold war or even from ambitions of our adversaries. These are the problems which will persist beyond the cold war. They are the ominous obstacles to man's effort to build a great world society, a place where every man can find a life free from hunger and disease, a life offering the chance to seek spiritual fulfillment unhampered by the degradation of bodily misery."

The development of man and societies of men has been closely related to the invention of tools and then of machines. Throughout the long span of the archeological record and later recorded history, man's security for survival and the scope of his life and actions have increased with the increased power of his instruments and machines. Machines are in fact instruments of man's rapid evolution, for they extend the natural powers of the human body.

Through many centuries the competence of craftsmen thus, evolved with the aid of tools. Then suddenly in the latter years of the 18th century aggregations of machines in factories displaced the skilled artisan from his unique role as provider of the expanding needs of society. From the beginnings of that "industrial revolution," the place of individual man in industry has been one of our major social problems. An important element of that problem is the relation of man to machine; and that, I take it, is the core of this Conference.

Our increasing power to change the world around us, to build things, and to shape new ways of life is due in large part to our machines. They give to man the leashed power of a million horses. They carry to distant places the words man speaks by means of his own lungs and vocal cords. Man has given himself wings more powerful than those evolved by birds.

It is the human mind that has enabled us to add these powers of machines to the natural powers of our bodies, because machines are the creations of man's mind.

Very few of the users of the machines of our industrial civilization, however, have had any part in their design. Few have more than superficial knowledge of the machines they operate. Under such conditions, the user of machines comes dangerously close to being the servant of the machine. Then the industrial worker develops a deep-seated sense of servitude rather than a buoyant sense of creativity made possible by machine-augmented powers.

I have alluded to the problems here because in my experience boredom or dissatisfaction with one's work fosters accidents and ill-health. You think that I, as one who spent much of my life in the academic world, have no basis for such an observation. I would recall with you my early experiences as a worker in a collar factory for 56 hours a week for $5.

But we should also recall that it would be a tragic industrial accident if the pioneering spirit of man were destroyed. It is that spirit which brought us from the rude caves of a dim and distant past to a noble capital city such as this. It was the adventurous spirit of our ancestral pioneers that built this great Nation in a few short centuries. Machines of industry can be made the servants, not the masters of uncompleted man as he strives for fuller realization of human aspirations.

It is futile, nostalgic folly to decry modern industry and the dominant role of machines. In industry lies our hope of conquering poverty. In industry lies the hope of free man from that servitude of which I spoke as being among my earliest industrial recollections. With the machines of industry, man provides the goods and the power he and his fellows need, makes more machines for the production of more power, more machines that provide energy for transportation and communication.

The amazing developments of science and engineering force our industries to design and build machines that satisfy the physical and spiritual needs of man. Never before in the long history of mankind have we had available so much energy and power to change our ways of life and the environment around us. We can do so with amazing speed with irreversible consequences.

During the course of the centuries, man evolved gradually in an environment which changed slowly except in times of catastrophe. This is no longer true. By the use of scientific knowledge, man can now alter his surroundings rapidly and radically. Men can move quickly from the environment in which man has lived for countless centuries into environments in which man has never lived before. Man can make his environment what he will. And this has profound implications for man's future.

Our early ancestor gradually moved from caves to rude huts to cold houses of rough hewn stone. For countless centuries he warmed himself before open fires and then within a century man has learned to build for himself towering structures by which he is surrounded by the humidity and temperature and light he chooses.

Throughout recorded history and until a century ago men moved on their own legs. Gradually they learned to travel a little faster and more easily by harnessing animals to carts on skids or wheels; boats were ultimately propelled by the force of wind on sails. And then in the short space of a century and a half, man has increased his speed of travel from no more than he could run to greater than the velocity of sound. Our environment can encompass the globe within a few brief days.

Throughout history there is recorded man's envious desire to fly like the birds. Each present day, countless thousands fly faster than birds at altitudes where oxygen for life is lacking.

Man suited his life to his natural surroundings throughout all of history until now, and lived in close association with countless other living creatures. Only slowly did he change the world as he found it. Laboriously he cleared the forest with his axe, drained the swamps with shovel-dug ditches, hunted wild beasts, and endured the insects. Within the last few years, chain saws felled trees across denuded acres, bulldozers changed the earth's configuration, chemicals and insecticides quickly altered the pattern of the fauna.

Ever more rapidly are we able to alter our environment. But we are still living, human creatures who are little different from our ancestors who lived centuries ago. The laws of nature are the same, and we are part of nature.

During times of rapid change which greatly tax men's courage it is, I suppose, natural that there should be widespread desire for the illusory tranquillity of the past. It is natural in these times of stress that men and women should occasionally grow weary and then regret the sacrifice and effort necessary to sustain the progress of civilization. But the record of the past reveals no time when the spirit of inquiry was secure against the threat of timid reactionary forces. That spirit was secured by valiant effort and sustained by faith in man's power to grow in dignity and knowledge.

In the history of mankind I find no times of which man can be proud in which men did not use their power to increase their understanding and use newly discovered knowledge to change their way of life. In change there is hope and growth. In the course of evolution, organisms have been developed whose relations to their physical environments differ greatly. But by the use of machines and by the

creation of controlled environments suitable to his survival man, more than any other form of life, has been able to extend the natural powers he has slowly acquired through organic evolution.

The biological suitability of these technical achievements is nevertheless limited by the characteristics of the human body as well as by the ingenuity of scientist and engineer. The healthy progress of our technological civilization requires that the human significance of machines be recognized lest great powers be inadequately controlled, or the body be subjected to unfavorable conditions which overtax its capacity for adaptation. If instruments, and the machine, and chemical products are to satisfy the needs of man, they must be designed to satisfy the biological requirements of the user. Unfortunately, engineers have known too little of how the human body works, and biologists are unable to design machines.

The primary responsibilities of the physician are certainly to maintain the health or repair the diseased or broken body. Without life all else is of no avail. But physicians, and all those concerned with the sciences of life, have a challenging opportunity to cooperate with engineers in the development of machines which satisfy the requirements of the human body while extending its natural powers. Spectacular examples of this are all about us. But when we think of the great achievements stimulated by the war in the development of artificial limbs for limbs that have been lost; when we think of how hearing aids have been made possible by the use of modern science; when we think of how aviation has been enabled to run its course by the use of oxygen equipment which made it possible for man to go through altitudes aeronautical engineers and designers of internal combustion engines made possible; when we think of how modern airplane pilots can fly through night and fog and cloud with the aid of instrumental devices—we have but a glimpse of all that can be done in order to make man better able to utilize his machine to his advantage.

I would predict that physicians of the future will deal to an increasing degree with the relation of man to the manmade environment, physical and social. For if we are to wage our continuing efforts to survive we can well ask—Survive for what? What do we propose to do with the world around us that we change so rapidly and so much? What do we wish to do with the pattern of our life that we are changing? Will we live more during a longer span of survival with more things at our disposal?

A leading industrialist recently listed critical problems of our machine age as the five A's: Anxiety, Absenteeism, Alcoholism, Accidents, and Apathy. The worker's anxiety for the complexity of mod-

ern industry and his inability to control the machine. Absenteeism as a symptom of boredom and lack of interest in routine work as a servant of machines. Alcoholism, the escape from an undesirable existence. Accidents, the consequence of boredom, dulled minds, and inability to control too powerful and badly designed machines. Apathy, the paralysis of the will that makes our industrial civilization the foundation for a renaissance of the creative spirit of men and women freed by machines from drudgery for mere survival.

Scientists and technologists finally, I would say, do more than improve the material conditions of life. They are partners of many others who seek to satisfy man's craving for spiritual and emotional satisfaction. Some of the greatest contributions of science to human satisfaction are even less tangible than those. Such are escape from the fear of uncomprehended natural forces, the quiet joy of understanding, relief from slavery to ignorance. These are subtle values of science which extend the horizons of the intellect and enrich the lives of men who have conquered machines.

What the world will be like a century hence was never so impossible to foresee. Like a gigantic snowball, larger and larger, faster and faster, science hurtles with us all into the unknown. Let us hope it is not toward a world of swarming ant heaps populated by highly mechanized barbarians, a new dark age with technocrats in place of theologians. There are times when the spirit of man leaps forward, conscious of its power, strengthened by its heritage of past achievements, challenged by new visions. Those have been the great ages of mankind—the age of Pericles in Athens, the Renaissance, the founding of our beloved Nation. The thrills of the present could be the birth pangs of another great age of free men.

I would end as I began with a quotation from President Johnson, who said: "We now can join knowledge to faith, and science to belief, in order to realize in our time the ancient hope of the world, which is a fit home for man. With the great powers we have available to us, with our vast store of knowledge, with our great hopes for the future, we need only wisdom to guide our knowledge."

Presiding Officer: Dr. Bronk, you have recognized the depths of our interest, and we appreciate your flattery, if you will, of that kind of statement, and we express to you, both in the attentiveness of this audience and its salutation, our appreciation of your touching upon the deepest aspects of the matter for us.

I should like to take this opportunity to do two or three things, among them to recognize the contribution to the work of this program, the development, of this program, of two men from whom you will hear on Thursday, though I will not introduce them now: Mr. Leo Teplow,

who has recently been promoted to Vice President of Industrial Relations and Public Affairs of the American Iron and Steel Institute, who is serving as the Conference Program Chairman; Hunter P. Wharton, General President of the International Union of Operating Engineers, who is serving as the Conference Program Vice Chairman.

I should like to express our thanks to the safety patrols, the boys and girls in the bright belts, who ushered us in here this morning. These are safety-minded sixth graders, I am told, from the public schools. They are led by Dr. Stanley Jackson, Principal of the Stevens School. Thank you very much for your help.

The situation, ladies and gentlemen, is that the President is on his way. This gives me the kind of opportunity which I look forward to with great interest, to speak to you without knowing at what point we will be interrupted.

My past experience in this includes, most recently, a meeting of the League of Women Voters in Pittsburgh, where the Chairman would get interrupted because the President was to be on his way. I was scheduled to speak for 25 minutes, and at the end of 55 minutes I was in full flight. But I will make a bargain with you, and that is this. I am scheduled to make a speech on Thursday, and any time I take with you right now will be taken off my remarks on Thursday. (Laughter and applause.) If that is the way you feel about it, I won't be here Thursday at all. (Laughter and applause.)

I suppose the sensible thing to do is relax, it probably will be a degree cooler, and therefore the thing to do would be to say nothing. But this is a city in which we simply cannot have a moment pass without somebody saying something, which we call the hubbub of the universe, as a matter of fact, and so I would like to take advantage of this opportunity, if I may, to point out what happens is not completely clear to all of us, at least in a conscious sense, and that is this.

This is a joint labor-management public meeting. May I simply call your attention to the fact that no such meeting takes place in any other country of the world, with perhaps the exception of one or two, on which we like to model our pattern at least to some extent.

Last week, I spent 2 or 3 days at the meeting of the International Labor Organization in Geneva. I couldn't help realizing then how much further we have gone in this country about working out a common basis for the handling of our problems than is true of almost any place else in the world.

At the ILO they are arguing this week about a whole host of decisive matters, and it is true of the UN and in most of the other world assemblies.

I point out to you that in the last 10, 12, 15, 20, or 25 years, what we have done in this country is to isolate more and more those

matters as to which we are in complete agreement and to recognize that this leaves matters of dispute and difference among and between us, but that there is a value to be gained in looking at those things on which we agree—and it is no accident that we are met today on a subject which was identified by some 18 years ago now, or 16, as a matter on which there can be agreement of the public, of labor, and of management. And we have approved of a point of agreement, taking the matter of occupational safety, to bring us to a discussion here today of a matter which Dr. Bronk has indicated in his remarks is so much broader than the one from which we started. I rather suspect that in the world which Dr. Bronk described the margin for disagreement and the area for using your elbows is becoming smaller and smaller. There just isn't the opportunity today to work at cross-purposes that there was 20, 25, or 30 years ago.

So I point out to you the value of coming together as a group, representing various elements in our society, to talk about a matter on which we agree, to enlarge that area of agreement, and then move on from there.

I point out to you, too, another element of this kind of meeting. I know of no other country in the world where we are learning so rapidly the ways of tying in public statesmanship and private statesmanship. I don't believe you can run a nation of 180 million people through only the offices of public government. And so what we are learning in so many different ways in this country now is how those who are representatives of the public government and those who are representatives of the private governments—because that is what you are—can work together on the problems that we face. More and more, I find the strength of what is going on in the Federal Government, I find it to lie in the working relationships between the private statesmen, which is you, and the public bureaucrats, which is us, and in the development of new ways of finding out, we of the government, what you in the private sector feel is most advisable, and you in the private sector getting some ideas of how things look from your standpoint, we find new ways of making democracy work.

And then I would like to apply this, if I might, to one or two other aspects, depending upon the time, on the matter which Dr. Bronk brought up. This whole matter of automation he spoke of in broad philosophical, but in quiet philosophical terms. You will be talking in terms of its safety implications.

Let me tell you a little bit about the aspects of automation as far as those pressing problems for which I have responsibility are concerned.

I say to you that I think what machines are doing now is piling up an additional 250,000 and 300,000 boys and girls on a human slag

heap in this country every year, as of right now. The machines are doing this to the work force in this country. They are taking away the need for individuals to do unskilled jobs.

I should like to make it perfectly clear that as far as I am concerned machines, automation, technology, are absolutely essential and are the only answer to our desire for full employment; they are the only way that we can maintain a standard of living above that of anybody else in the world. Only by using the full efficiency of, in Dr. Bronk's phrase, the human body, with its natural powers extended by the machine, can we hope to maintain a standard of living above that of all those with whom we compete.

So let there be no misunderstanding of the necessity of technological developments. Let there be no misunderstanding either of the necessity of working out those human adjustments which are necessary, if a few are not to pay the price for the progress of the many. I come back to this statement right now. If you take the cruelest statistics in the world, which are the statistics on juvenile delinquency, on lack of education, on unemployment, on conditions in particular parts of some of the tightest in the country, you come to the conclusion that we are piling up today 200,000 and 300,000 additional boys and girls with nothing to do, because they don't have the competence to do more than the machines can do, and the machines are willing to work for less than a living wage.

Let me give you a few other statistics. There are at least part of the answers to the problem. In the next 10 years, 35 million boys and girls will come into the work force in this country. Unless there are changes in the present situation, 9.5 million of them will come in without high school diplomas, and there is not going to be anything for them to do, because, on the whole and on the average, the machines now have a high school education, and jobs that can be done by somebody with less than that education will be done by machines. We have simply got to change that picture and that situation. It is a situation which is paralleled, on the other side, by a decreasing number, or by a lessening of the increase in the number of jobs which the private economy has been producing until very recently. This is another aspect of technological development. If you take the period from 1947 to 1962 you will find that the private economy, the profit sector of the private economy, produced no increase in the number of full-time jobs, at a time when the work force was increasing at the rate of about a million a year.

Now, one of the extraordinary things and most encouraging things that is going on today is that that trend has been so sharply reversed. In the last 12 months there has been an increase of 2.2 million jobs, that is, between May 1963 and May 1964. The unemployment rate

dropped; the unemployment rate dropped as between April and May, the largest drop in a very long time.

This whole process is being reversed—the process of that period between 1957 and 1962, and now the private economy is coming forward with the jobs, the jobs that make worth while the training programs and that kind of thing. And yet, even with the burgeoning economy, even with a marvelous strengthening in the economic structure of this country, we are going to have to recognize the fact that one of the consequences of automation is that there is no longer any place in this society for the untrained, the unskilled, the uneducated boy or girl.

In my judgment the poverty program or the poverty problem as a whole is a terrible problem, but in my judgment, too, that part of it, one which we have simply got to concentrate our attention on is the part that we have presented by the situation with which we are concerned.

The situation, then, is one on which, as an overall matter, we face a special problem.

(Arrival of the President of the United States.)

Ladies and gentlemen, I would like to introduce the next speaker to you. Mr. President, permit me to say to you that this is your Conference on Occupational Safety, a group of over 3,000 men and women who have come at their own expense from all over the country to join you in the program of occupational safety for which you are responsible, and to wish you, Mr. President, all that goes with our saying that there is one piece of occupational safety in which we are more concerned even than our own, and that is yours.

The President of the United States.

Address by the President of the United States

The Honorable Lyndon B. Johnson

Secretary Wirtz, Delegates. In this conference, and in your daily work, you are concerned with human safety. In many respects, this is a strong, common denominator between your work and mine.

The first and constant concern of the American Presidency in this age is human safety also. Making the world safer, making this Nation safer, the values of our society safer, must be the objective of all that a President does, whether he is talking with old and good allies about problems between them, seeking with adversaries better understanding between us, or working with Americans themselves to overcome the problems in our society among ourselves.

Two thousand years ago Cicero said "The safety of the people is the supreme law." This truth has not changed. It is fundamental to the concept of democratic society in the West. It is fundamental to the purposes and policies and programs of your American Government in this age of clear and present peril. It is fundamental to the responsibilities of the office which was thrust upon me so tragically seven months ago. I hope—and I don't mind admitting—that oftentimes I pray that my discharge of those responsibilities will always help guard and guide all mankind toward a safer life than men have ever known before.

I speak as I do to you because there is another common denominator between our work. The problems in your field of industrial and occupational safety are many and perplexing. Yet you know two things about those problems: You know, first, that there is no real comparison between the attitudes within industry today and 50 years ago, or 25 years ago, about the safety of the workingman. Second, along with this progress in our attitudes, there has been great progress in our abilities to eliminate the hazards and the dangers and the causes of industrial accidents.

So the question today is not whether we can eliminate the cruel costs of the on-the-job injuries, disablements and deaths, as it is the question of when. When can we succeed by education, by leadership, by patience and perseverance, in cutting this costly toll? In many respects, this is the situation facing this Nation and its President, whoever he may be, in dealing with the threats to the safety of the world and dealing with the threats to all the human race.

There is no real comparison between the attitudes of most of the world's governments today and 25 years ago on the role of warfare as an instrument of national policy. War is obsolete, obsolete because there can be no winner. War is obsolete because the progress in mankind's abilities and knowledge makes possible and imperative a new measure of national greatness, the measurement of how men are served by their system. The question is not whether the world can eliminate war. The question is when—when all nations will have the courage and the good sense to do so.

This generation of Americans has made an investment without parallel in history in the cause of keeping peace. I believe it is the desire of the American people that their President work wherever and however and whenever he can to support that cause of peace and to keep freedom safe until war is abandoned among all nations. Such a day may not come quickly. It will not come without unremitting effort and unrelenting vigilance. It cannot come without education or without leadership, or without patience and perseverance. But

these qualities we have to give and we shall give them—give them to the last full measure to make this world safe and to make our freedom secure.

Whatever your politics, your philosophy, or your own individual perspective, I hope you will take home from your week here at least one strong and abiding conviction, and that is that your Government, and those who serve you in it, are determined that peace shall be preserved in the world, that the cause of freedom shall not be failed, and that the new horizons of human knowledge shall be put to the greater service of men in our own land and around the world to make human life safe and human hopes more secure.

Thank you.

Part II

Report of the Conference to the President

REPORT TO THE PRESIDENT

President Johnson set the keynote for the 1964 President's Conference on Occupational Safety by pointing out that safety is a universal problem, covering not only the safety of individuals but the safety and security of nations and of the world. He thus drew the parallel between world peace and occupational safety.

The theme of the Conference, "Mobilizing Leadership for a Safety Breakthrough," was thus epitomized by the personal presence and participation of the President of the United States. This theme was also underlined by Reed O. Hunt, the Conference Executive Director, in pointing out that the program of the 1964 Conference, in recognition of the social and technological changes taking place in the modern world, was designed to contribute new thinking and leadership in those industries and activities which were growing most rapidly or which had been previously neglected in considering occupational safety.

Hence workshops had been organized for such activities as health services, in view of their rapid growth; environmental hazards, springing from more concentrated populations and new chemicals and radiation hazards; construction, one of the largest and most hazardous of major industries; public employees, in recognition of the rapid growth, not only of Federal but also of State and local government services; off-the-job safety, recognizing the direct impact that nonoccupational accidents had on production efficiency; research and development, one of the newest and most rapidly growing industries; and in design for safety in layout, in process, and in production equipment.

However, the basics could not be overlooked. Consequently, workshops were also designed to bring new thinking to bear on better accident records, determination of accident costs, safety standards, the changing structure of agriculture, and safety in trades and services, and in manufacturing.

Summaries of all workshops will be found on the following pages.

Dr. Detlev W. Bronk dealt with the very basis of occupational safety in emphasizing the humane values which must permeate an industrial civilization. In graphically portraying how man had extended his ability to alter what had previously been regarded as natural limitations of man's power, he pointed out that all of this

cannot be regarded as progress unless it is designed to increase the stature, the dignity, and the freedom of the individual.

An evening plenary session dealt with the integration of safety into occupational training by both schools and industry, with the essential cooperation of the community, of organized labor, and through the medium of such agencies as local and State safety councils.

Finally, the plenary session on the third day presented a unique panel discussion among three of the great authorities in the life sciences: Dr. Hans Selye, of Montreal; Dr. S. I. Hayakawa, a semanticist of San Francisco; and Dr. Howard Rusk, of New York, who has devoted his life to rehabilitation. Thus the separate disciplines of those who study the basic constitution of living matter, the significance of communication, and the rehabilitation of those who have become disabled, were all brought to bear on the problem of making accident prevention more effective.

W. M. Larke, of the British steel industry, compared the British and American programs of safety promotion, enabling each to learn from the other.

The 3-day conference was brought to a close by a moving and inspirational address by the Secretary of Labor who urged that all of the insights and all of the techniques which had been discussed during the Conference would be useless unless they were put to work in the workplace and in the home community. He, therefore, urged that all those at the Conference could make the 1964 Conference most significant by their efforts to promote safety more effectively and by enlisting more and more people in a program which typified the best in human aspiration and humane progress.

Mobilizing Leadership for a Safety Breakthrough

IN THE HEALTH SERVICES

How Safe Are Health Workers? A panel of distinguished members of the health and safety professions considered this question, looking first at the national health and safety picture in this field, and then successively at the nursing and other hospital employee hazards, at those of medical research laboratories, at pharmaceutical research and industry hazards, and at the community's interest in all of these.

The moderator highlighted the message of this workshop by making three points vital to the health professions and to the theme of this year's conference. First, *leadership* is provided by educating both

professional organizations and the rank and file of management and workers to the need for intelligent planning and by motivating all workers, individually, to participate responsibly in the maintenance of good health for themselves, their coworkers, and others and in the prevention of unhealthful and unsafe practices. Second, success in this area will be achieved only by an integrated effort of health workers and safety personnel. Third, the health professions at this time have a major contribution to make in further improvement in safety for *all* workers in *all occupations* since it will be primarily through the knowledge, skills and techniques of workers in the health professions that defects in worker capacities and inadequate reactions to stress that result in accidents and illnesses will be corrected and, more importantly, prevented. These gains will be made only with the full cooperation of management, which in the health professions means the individual physician, researcher, nurse, or administrator.

Between 1950 and 1960, the number of workers in health services increased an amazing 60 percent due to population growth, an aging population, changes in social values, and so on. This activity, ranking seventh among major occupational groupings, now employs over 2½ million people and encompasses types of establishments from individual practitioners to large hospital operations, from one-man research laboratories to medical research institutes.

The technology in which health workers are involved is producing an increase in work-related injury and disease while many of the incentives to health and safety control customary in other industries are inoperative in the health services. Health hazards to health workers have been dimly perceived and inadequately studied by both "management" and "labor." Reliable data need to be accumulated and indicated programs instituted.

Some of the problems of control in this field were pinpointed: health employees work as individuals, without physical supervision; often they do not work at a constant site; health workers handle people who may be noncooperative or unpredictable. The need was stressed for better communications between the scientific and administrative personnel in health services.

Health service employees may be encouraged to "make do" with equipment, whereas, in other industries where hazardous operations exist, extra money to purchase the highest quality equipment would never be in question. Better training aimed toward hazard awareness and increased effort on the part of management to coordinate the many disciplines required to produce effective control of the environment are essential to significant progress.

Several reasons impel hospitals to be interested in safety programs both for themselves and for their patients. Hospitals are now the

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Nation's largest employer, exclusive of government agencies. Also, under widespread criticism regarding the costs of hospital care, hospitals are becoming very cost-price conscious. Hospitals are looking for ways to provide new leadership to accident prevention. That fresh breakthrough may be waiting upon a revitalization of the idea of employee participation in finding the answers to safety problems.

The program of employee health conservation carried on in the Mayo Clinic and the contribution which the alert industrial nurse can make to such a program were described. The periodic physical examination is satisfactorily accepted by employees and is carried out annually for those over age 30 and every 2 years for those under 30. Special survey testing is provided for employees in hazardous areas. One of the associated hospitals has a safety committee which conducts an active safety program.

Action was recommended to (1) evaluate hazards in medical research and prepare corresponding tested countermeasures; (2) provide consultation services by safety and occupational health specialists and disseminate evaluated information for the education of the worker; (3) prepare standards for reporting cases; and (4) encourage early diagnosis and treatment of cases by selective authorization of free hospitalization for suspected occupational disease without loss of pay and without charge to sick leave or vacation time.

The experiences of a health and safety program for a pharmaceutical company were presented. Emphasis was placed on the necessity of continuing indoctrination of all workers from time of employment; the necessity of determining toxicity of new chemicals; the importance of periodic physical examinations for workers and of continuing scrutiny and analysis of work procedures by health and safety personnel. It is of paramount importance that every worker, in turn, serve on safety comittees and that every accident, no matter how minor, be reported and analyzed and corrective action instituted.

The community has a definite interest in promoting the health and safety of health workers. Some of the barriers that have stood in the way of better results in safety among the health disciplines include: the practice of hiring poor health (and thereby safety) risks; the nonprofit status of health agencies; medical ethics; professional courtesy; medical third parties not trained in this specialty; lack of space for facilities to maintain employee health; and the dearth of publications on safety and health maintenance in the general medical literature. The community's interest is large since the community will receive: (1) a much improved ultimate product, namely, *patient care* and; (2) a secure, safe, and healthy staff of employees to work for this end.

IN WORK ENVIRONMENTS

Leadership in the Control of Environmental Hazards. The salient problems associated with control of occupational environmental hazards currently appear to revolve about the need for communication of known and available controls to small industrial units; the rapid rise in kinds and uses of materials; the need for epidemiological studies to identify unknown and unexpected chronic toxicity problems; the need for more widespread worker and user education; the need for great support to State health control bodies; and the introduction of larger numbers of technologically trained people in the fields of industrial and public health.

Population is increasing, available land area per person is declining, and standards of living are advancing. All of these changes increase the demands man places on his environment, and this load will continue to increase at an even faster rate.

The goals toward which improvements should be made are: that conditions of employment should be such that no worker need inevitably sustain injury or disease as a result of his employment; and that no product which is incapable of being used safely for its intended use should be placed in the hands of the consumer.

The attitude and performance directed toward these problems are changing for the better. The old doctrines which held disregard for buyer and worker where health was concerned are being discarded. Industry has found ways in research and in a genuine concern for public service to seek out and remove hidden hazards in processes and products.

Information which reaches the public has increased in recent years. Unions and industry have included in their safety programs material developed in governmental and private laboratories.

Where good occupational safety and health programs are developed by companies, their effects carry over to the homelife of the worker.

Some current areas of interest in environmental control are: early, sensitive indicators for predictive blood tests in checking changes in the worker before he is seriously affected; stresses, such as heat and noise, which have been found to be relatively more important in the health control field than was formerly appreciated; the effects of combined causes of disease; and the importance of variations in the effects of different materials on individuals, rather than on larger numbers of the population.

There has been an increasing tempo in the leadership of the organizations participating in these Conferences. Noticeable among them is the Division of Occupational Health of the U.S. Public Health Service, celebrating its 50th year.

WITH BETTER ACCIDENT RECORDS

Using Records To Prevent Accidents. One speaker quoted a very potent statement of the Chairman of a State Industrial Commission that, "Nothing of consequence can long be maintained without good records." Safety is certainly of much consequence, and the discussions today have reflected the necessity of records and their use in preventing accidents.

The speakers cited the use of in-plant injury records in examples such as the following:

1. *The selling of a client or policyholder management on the worth of a safety program.* In this connection, the use of workmen's compensation experience rating (covering the injury records) was used to demonstrate the soundness of the safety program in the economy of running the business.
2. *As the foundation in directing the accident-prevention program of the plant.* In this area, a speaker mentioned the speed with which the plant compiled injury data and the immediate attention given by management to initiating corrective action. It was indicated that in order to give direction to safety efforts, there must be a continuing analysis of injury reports to reveal the hazards, types of acidents, and places of occurrence.
3. *Measuring the safety results obtained by supervisors.* Two methods were outlined:
   A. Incentive plan. Records are used in giving foremen monetary recognition for safety performance.
   B. Supervisory appraisals. Injury statistics are used to appraise foremen on accident prevention. Performance is measured against the foreman's own previous record and against those of others in the same plant environment.
4. *Selling company personnel on the need for action.* Records reflected trends of certain types of accidents. These were used in soliciting cooperation of employees and in establishing safety requirements. The data were used also to convince supervisors of the importance of setting an example in following safe work practices.
5. *Compilation of in-plant injury data by industry.* A company's record may be compared with that of its industry. The record permits industrywide safety activities. State-compiled injury data aid the State Safety Council and the Extension Division of the State University.
6. *International use.* Standardization is leading to progress in the difficult field of developing comparable conclusions among nations. The ILO has disseminated information to show the

results of safety activities and to assist in campaigns against specific types of accidents in countries having common hazards.

The panel discussed various sources from which injury data can be obtained: the employer's own accident files, insurance records, and the statistics of trade associations and State and Federal agencies. It was concluded that the use of records in preventing accidents is a vital and necessary activity in conducting a safety program in industry.

IN CONSTRUCTION

Construction Safety—Patterns for Action. One of the more striking points developed in this workshop was the premise that although construction as an industry does possess certain inherent hazards, the high-accident frequency and injury-severity rates which prevail can and should be reduced.

The tenor of the construction workshop, like that of the Conference, was the determination to mobilize leadership for a safety breakthrough. That objective can be achieved in part by application of the construction session theme "Patterns for Action"—to stimulate new and more vigorous action at all levels, through the leadership of management and labor toward a more constructive approach to construction safety.

There was consensus on the necessity—and logic—of a combined effort by management and labor to improve the construction industry's record.

As was brought out in sharp focus in the discussion, the principle of using the leadership technique has been tested in some cases with gratifying results.

The frank discussion and sincerity of purpose of the approximately 600 industry leaders from all regions of the country, representing both management and labor, produced a refreshing effect which bodes well for the future of this industry from an accident-prevention standpoint. No one group attempted to impose its attitude or program on the others.

Bearing in mind the maxim that safety and efficiency are synonymous, combined with the fact that construction is the Nation's leading industry, it is obvious that successful accident prevention in the construction industry would constitute a major contribution not only to the industry but to the Nation as a whole. There was consensus on the desirability of a dynamic joint leadership action program. The time is now.

IN EDUCATION

The implications of automation and of other technological advances, particularly for the waves of young people who leave high school and college each year, either as graduates or dropouts, to join the Nation's work force, are important for industry and education. These implications involve initial training for occupations given in regular school programs; training opportunities for the disadvantaged youth; adult educational offerings; training given by industry for its own employees; and retraining for new occupations given by schools and industry. Business-industry and education face a new challenge for all-out joint efforts.

All schools have a responsibility at every level of education to prepare our youth and the workers of tomorrow to live and work safely, else there is the danger of losing not only the battle but perhaps the war on accidents. This task involves the preparation of people to live safely with the technological changes brought about through progress.

Evolving technological change is going to demand more educational preparation, is going to permit a shortened but an even more productive working life and longer periods of so-called retirement. The increasing number of years spent in education must yield diplomas which testify to knowledge gained, attitudes engendered, skills developed, and responsibilities undertaken, which are meaningfully perceived and correspond to the needs of an ever-changing society under the impact of automation and technological advance. Less and less can we permit this already shortened period of the productive life of an individual to be interrupted by needless accidents. An all-inclusive precept must be that schools cannot live in a vacuum but must utilize all resources of the community and work cooperatively with all persons who have a direct interest in safety education.

The basic concepts brought out in this session by the principal speakers and representatives of business, labor, and community groups suggest the following:

— The home environment and family concern for safety are prerequisites for developing proper attitudes toward safety.

— Occupational training, incorporating safety education, should be provided where needed for all youth and adults regardless of their varying talents and socioeconomic background.

— There are no shortcuts in the performance of everyday skilled tasks. Each operation properly performed contributes to safe living.

— Youth are influenced as much by example as by instruction, which places responsibility upon parents, the community, the

school, industry, and labor to make sure that the examples are appropriate for youth to follow.

— Occupational information essential to safety education should come from business and industry.

— The preparation and upgrading of teachers should include their participation in seminars and consulting services made available by business and industry.

—The technological competencies of business and industry should be utilized in the establishment and the operation of all levels of occupational training.

—Local safety councils representing a cross-section of citizen groups provide the best means for coordinated efforts in assisting the school's safety education program.

—All communications media should be utilized to inform the public about the school's safety education program.

This plenary session concerned with mobilizing for a safety breakthrough in education reemphasized the need for a unified effort to prepare all youth and adults to work safely at every level of occupational endeavor.

It is obvious that aggressive leadership is necessary and must begin at the national level. Previous occupational safety conferences have suggested positive action. This session further reinforces the need for a definite program engendered at the national level and extended to the most remote occupational training effort of this Nation.

IN PUBLIC SERVICE

Public Employee Safety. The purpose of this session was to explore methods by which public employee groups at the Federal, State, county, and municipal levels could better implement elements of effective accident prevention programs.

It was agreed that an effective program is measured only in terms of reducing accidental loss and thus improving the effectiveness of the services rendered by the organization of which it is a part. Working toward these two main objectives, an open-end discussion with full audience participation discussed the implications for safety programing in such areas as public service, health services, and public works.

Successful practices and available resources in a variety of settings were shared, as well as unsuccessful practices which pointed up weaknesses in current accident prevention programs and their implementation.

Such questions as "How do you design an effective safety program?" and "What methods of communication do you use?" appeared to be foremost in the minds of the participants.

As a result of the discussion of question No. 1, the following suggestions for action developed:

1. Cooperative planning of safety policy is an essential ingredient if the program is to be "sold" to employer and employee.

2. The safety program must have sufficient flexibility to be adaptable to changing conditions. A program loses its effectiveness if it remains unaltered or static.

3. In order to save money, it is first necessary to spend money. Economy is not the watchword of an effective safety program.

In response to the second question concerning communication, the following guidelines were advanced:

1. To be effective, the communication process must be two-way in nature; i.e., from the employer to the employee and from the employee to the employer. Safety policies which are mandated to the employee through formal channels only tend to lose a great deal of their effectiveness and impact.

2. While the printed word is effective, the participants felt that there is no substitute for personal contact such as small group discussions on safety policy and practice.

3. The safety message must be meaningful to all parties concerned if effective communication is to be carried out.

4. For effective communications, there must be a system of rewards and punishments for those who comply with established policy and for those who refuse to conform.

5. This is an area where there is great latitude for imagination and innovation, of which several practical and working suggestions were cited by the participants.

6. The process of communication was recognized as a many-faceted activity that by necessity must appeal to the varying interests of those concerned.

7. For the communication process to reach its full potential, it is essential that it be a continuous process rather than a sporadic endeavor that soon loses its effectiveness. To keep the flow of information constant, it is vital that all available resources be employed; e.g., safety committees, employee union groups, and national and State safety organizations.

While there was a productive interplay of ideas on the preceding questions, several problems arose out of these discussions to which there were no satisfactory answers and toward which more attention should be directed. These were:

1. How do you get the "unconverted" to participate (both management and labor)?

2. How do you get top management to recognize the need for a safety program, especially in such organizations as those which are susceptible to rapid change for political or other reasons?

3. How do you prepare and present an adequate budget for safety program activities and have it accepted, especially in view of the fact that between 1960–75 there will be a 37-percent increase in government employment, particularly at the State and local levels?

4. How do you get intercooperation of public employee organizations so that their concern in their activities reflect not only on their particular group, but on all public employee groups?

5. How can public employee groups gear their programs, not only to members, but to the whole concept of overcoming public apathy to accidents?

WITH IMPROVED COST DATA

Finding the True Accident Costs. The workshop concluded without any expressed doubts or oppositions that "accident costs" are absolutely essential elements for effective management planning of safety programs. This conclusion in no way minimizes the basic concern for the humanitarian impact of accident prevention, but serves as the basic justification for expenditures which may at times be difficult to sell to top management or to stockholders. It was also pointed out that few management people and even fewer stockholders realize the substantial losses that are associated with accidents occurring in the course of job operations. The cost associated directly with injuries such as workmen's compensation allowances for lost pay and sick leave are readily recognizable, but the associated cost of property damage, interrupted production, and lowered employee morale and company prestige are not so readily apparent.

The panelists, however, demonstrated that such cost can be determined with reasonable accuracy by means of a variety of estimating procedures. These procedures are not infallible, but when the possible pitfalls are known and care is taken to avoid entrapment, they can be developed on a very workable basis. It was stressed that the traditional terminology of "direct and indirect costs" and "insured and uninsured costs" are not fully descriptive and that the preferred terminology should be "direct costs and other costs." The direct costs which include either insurance premiums or direct payments of workmen's compensation are readily ascertainable. The "other costs" are much more difficult to record and in most instances must be estimated. There was general agreement that the estimating procedures in determining these costs must be based on specific studies made within each operating unit, taking into account the peculiarities of the particular

establishment or operation. It was also agreed that the basic factors used in these estimating procedures must be updated at fairly frequent intervals, probably every 5 years at least. Great emphasis was laid on the fact that all such studies have revealed that property damage losses are exceedingly important and that without such studies they are frequently overlooked.

Numerous testimonials were offered by the panelists and by members of the audience of the effectiveness of overall accident-cost figures as justification for the existence and the expansion of in-plant safety programs. Practitioners of the art indicated, however, that the development of a valid cost estimating procedure and its acceptance by management as an indicator of the losses resulting from accidents was a long drawn out and difficult procedure but that it was well worth the effort.

All of the speakers paid great tribute to the late H. W. Heinrich who first developed a workable method of estimating complete accident costs in industry. The "Heinrich Method" involved the well-known "4 to 1" formula which served a very great purpose in its day, but refined methods now in vogue indicate that it is impossible to establish a valid ratio which will hold for more than one establishment. The true ratios for individual operations may range from 1 to 1 to 1 to 50 under different circumstances.

The basic Heinrich concepts, however, are still valid.

Some 250 delegates attended this session, and a substantial proportion of the audience gave lively participation in the discussion. Many of the delegates were well versed in the concepts of accident costs estimating and were seeking information on the fine points of the procedures. Others obviously were entirely uninformed in this subject area and were amazed by its usefulness and somewhat awed by its perplexities.

IN OFF-THE-JOB ACCIDENTS

Off-the-Job Safety as an Element of Total Safety. The alarming threat of off-the-job accidents to the economy demands immediate attention by business, labor, and citizen leaders mobilized to attack the problem. Billions of dollars of important purchasing power are lost through accidents that result in personal suffering, lost production, and expenses to the community. Aside from the cost and loss of manpower, accidents result in poverty and deprivation of tremendous magnitude.

A company of any size can do an effective job in preventing employee off-the-job accidents and in determining costs. A realistic estimate of the cost to the employer and employee for off-the-job

accidents is $10,000 for each 100 employed. Consequently, off-the-job accidents cause a direct drain on profits.

Safety education should begin with the very young and should be introduced into all schools to provide a basis for reaching children at an early age.

The biggest job for the leaders is to bring about increasing understanding among all citizens that the nonwork accident menace is one of the grave problems of our generation and that overcoming it is one of their prime citizen responsibilities. To accomplish these aims, it is recommended that:

1. All companies and agencies study their off-the-job accident problems and costs and establish effective safety programs.
2. Safety education be established in all schools as a regular part of the curriculum.
3. Leaders and citizens support and participate in organized community safety efforts.
4. Safety organizations develop comprehensive off-the-job safety programs with full cooperation from, and utilizing the leadership of, industry and other organizations.

Officials of public and private agencies concerned with national growth and efficiency can promote these objectives by exercising their leadership in their respective organizations to eliminate off-the-job accidents.

IN RESEARCH AND DEVELOPMENT

Building Safety Into Research and Development. As the Nation becomes increasingly oriented to an economy of growth based on research and development—with national defense, aerospace, and nuclear programs receiving major attention—both the private and public sectors of the economy rely increasingly upon the laboratory for new ideas, new products, and new processes. Clearly, "The Industry of Discovery"—as R&D is sometimes called—must give close attention to safeguarding from injury all those who are engaged in the unceasing effort to extend the frontiers of man's knowledge of himself and of the universe in which he lives.

By its very nature, most R&D is pioneering—doing what has not been done before—and to pioneer means to lead. Leadership of the highest order is essential, not only to achieve further technological progress, but equally important, to accomplish a breakthrough in protecting R&D workers from the hazards of their work.

If such a breakthrough is to be accomplished, leadership in R&D must successfully cope with a series of problems including the following:

1. There is a phenomenal growth, both qualitatively and quantitatively, of R&D work in the United States. Today's 2¾ million specialists working in R&D make up about 3.6 percent of the Nation's civilian work force. By 1970, the figure is expected to reach 4.7 percent.

2. Currently, the Nation is spending close to $20 billion a year on R&D work. Industry, colleges and universities, and the Government—all are involved.

3. Scientists and related technical personnel are, and will continue to be, in short supply. Current manpower forecasts predict heavy demand for scientists, engineers and technicians, and similar technical workers.

4. Neither the Nation, the employer, nor the worker himself can afford to waste the enormous investment in training and skill represented by this manpower "corps d'elite."

5. R&D involves, inescapably, work that is novel, untried, unproved, that has never been done before. R&D, if it is to be *done at all*, must *be done safely*.

6. There is a possibility that a lack of safety-mindedness prevails among a large segment of our R&D personnel. Or perhaps the researcher, accustomed to working independently and accepting as "inevitable" the risks of his trade, becomes complacent in relation to the hazards he faces.

So the question, reduced to its simplest terms, becomes "How can we fully protect the safety and health of the research scientist, engineer, and technician, and thus conserve an expensively-acquired, essential, possibly irreplaceable skill?"

Conclusions

1. There is a compelling need for extending and improving the amount and quality of safety training at the academic level. Leadership of collegiate administrators and faculty is essential in providing the basis for such training for engineering and science students. The second essential is active participation—by administration, faculty, and students—in safety programs (safety committee work, inspections, accident investigations, safety specifications, etc.).

2. Leadership must see that careful *pre*search for safety *always* precede research. It must determine and act on such safety parameters as: a complete search of the literature on material toxicities, reactivities, and the like; what "tools" and equipment should be used; how the mechanical safety of any motive equipment can be assured; how facilities to handle explosive substances can be designed for safety; how adequate the electrical wiring, appliances, and insulation are;

and many other factors which might involve danger to life or property.

3. Top leadership is needed to establish and maintain effective liaison and coordination between scientists and safety personnel in doing research. Under management policy direction, safety must be integrated into the actual work. *Participation* by all concerned—in safety planning, in safety committee or "task force" activities, inspections, investigations, etc.—is an effective means of aiding such coordination.

4. Scale-up from laboratory bench to pilot plant and on to the full-scale production provides a major opportunity for learning—in advance—the magnitude of potential problems likely to be encountered as the size factor is increased.

5. There is a great body of knowledge available in this field. Such knowledge must be used. An extensive bibliography has been prepared by two workshop consultants, which provides leadership with a key to existing literature on R&D safety problems and their solution.

IN AGRICULTURE

Agricultural Leadership, Its Achievements and Opportunities. The annual toll of accidental deaths, injuries, and property damage in agriculture continues with frustrating persistence. The technological advancements in agriculture have brought accompanying new hazards at an ever-increasing rate. It is imperative that agricultural leadership at all levels respond vigorously and assume its responsibilities to bring about a safer American agriculture.

The Agricultural Safety Session of the 1964 President's Conference on Occupational Safety, in analysis of "Agricultural Leadership, Its Achievements and Opportunities," submits the following action recommendations:

1. Manufacturers and distributors of goods the farmer buys should expand their safety training programs through dealers for the benefit of the ultimate consumer.

2. Manufacturers, dealers, and salesmen are strongly urged to recognize their responsibilities to set safety examples in field demonstrations, sales presentations, and deliveries of equipment and materials.

3. The workshop endorsed the current joint project of the National Retail Farm Power and Equipment Dealers Association, the National Safety Council, and the Farm Equipment Institute to distribute point-of-sale safety literature and encourages applicable principles to other types of farm products, supplies, and services.

4. For the purposes of rural safety, farm organizations are defined in this concept to include: all general farm organizations, commodity groups, local and regional farm cooperatives, educational and service organizations, and all allied agricultural industries. These organiza-

tions should examine their policy statements and aggressively pursue *by action* their stated support for rural safety activity by providing the necessary finances and leadership for county-level rural safety programs based on coordinated State and national rural safety efforts. It is further recommended that these organizations, particularly their State and national leadership, should lend concerted effort and encouragement to establishing comprehensive rural accident research which would yield more extensive, basic, and usable data on rural accidents and their underlying causes.

5. Effective rural safety programs are conducted at the local level. The workshop therefore recommends that county safety councils be established to coordinate such safety programs if the problem of servicing such councils can be satisfactorily answered. Specific local projects can be carried out by special committees.

6. In those counties where no rural safety organization now exists, it is recommended that the County Extension Service initiate a meeting of rural leaders to activate a coordinated rural safety program.

7. The workshop recommends that the Extension Service employ on its staff, at both Federal and State levels, at least one full-time farm safety specialist who will give Federal and State leadership to farm safety in all its aspects, including work with farm youth and their leaders.

8. All women's organizations should encourage their individual members to assume their leadership for family safety.

9. The workshop especially recommends that women's organizations give active support to youth safety programs.

10. The workshop recommends that women's organizations cooperate with State and local officials in analyzing the safety needs of the community and in undertaking safety programs.

IN DESIGN

Safety Through Design. With the current exploding technology, it becomes evident that there is an ever-increasing need for a more comprehensive and concentrated effort to be directed toward the elimination or minimizing of hazards from job operations and work areas. This can be accomplished most effectively and economically at the time equipment is about to be purchased or modified, or during the period of planning for any new or altered facility, process, or operation.

The principal objective of this workshop was to exchange ideas for eliminating unsafe physical, mechanical, and environmental conditions which might cause accidents. The four discussions centered

on safety considerations in the design and layout of facilities and the safe placement of equipment within structures; preplanning to safeguard physical and mechanical hazards; and providing for environmental controls and equipment noise abatement during the planning stage.

In the presentation of "Safety Design Considerations for Layout of Facilities, Placement of Equipment, and Production Processes," it was concluded that there should be a company policy which will declare and spell out management's intentions in this area. Further, a written procedure should accompany the policy, stating in detail how it is to be implemented.

In carrying out the program of safety design for new or revised facilities, the safety coordinator will find himself working through individuals and groups, inside and outside his immediate organization. Among these will be engineers, budget directors, purchasing people, outside contractors, corporate safety and health administrators, insurance representatives, and local, State, and Federal safety and health personnel.

As with most safety endeavors undertaken today, the problems associated with designing safety into new or revised facilities are complex. The scientific advancements made in recent years throughout industry do not make the task any easier. Therefore, it must be agreed that if the safety coordinator is going to be successful with his program for safety design in new facilities, he must gain the cooperation and teamwork of others—both inside and outside his organization.

The presentation of "Safety Design Considerations for New or Revised Chemical Processes and Process Equipment" concluded that:

1. Chemists and pilot plant engineers must look for and describe all the process and processing hazards involved.

2. As many standards and guides as possible should be provided to the design engineer, describing the company's policy on the extent of risk to be assumed. This is not meant in a derogatory or negative sense. Everything undertaken entails a degree of risk, and judgment is woven into every decision involving the extent of the safeguards to provide. However, this is management's responsibility and wherever practical its concepts should be made clear.

3. By the proper delegation of authority and fixing of responsibilities, management should provide a system of checks and balances that minimizes chances of overlooking any important safety facet or bypassing any personnel employed as specialists who can contribute to a safe and efficiently designed installation.

In the presentation of "Safety Design Considerations for Production Equipment," it was concluded that safe operations are the result

of good design and planning by a team of management men dedicated to the elimination of accidents. During all phases of design, the team should keep in mind that every effort should be made at all times to provide maximum protection to the operator; or to be more emphatic, 100-percent protection 100 percent of the time.

There is one point relative to machine safeguarding that should be emphasized and should be clearly understood by everyone associated with safety. The safety standards in use today are the result of the investigation and analysis of thousands of accidents—they were not developed just because someone thought an accident could occur. There can be no question that unfortunate accidents will continue to occur in spite of safety efforts and that additional safeguards will be designed or existing ones will be made more sophisticated. A point to be emphasized is that every time one of these safeguards is recommended, the safety man is actually the middleman in the transfer of knowledge accumulated by many people as the result of many accidents.

In summary, these four points were made: We are concerned first with the safe design and construction of the machine itself; second, with the guarding of the power transmission; third, with the proper and safe design of the tools or dies used; and finally, with safety at the point of operation.

In the presentation of "Safety Design Considerations for Noise Abatement in Facilities and Equipment," it was concluded that noise control in industry is essential for two reasons: first, excessive noise can cause permanent and irreversible damage to a worker's hearing mechanism; and second, it can interfere with speech communication. It was stressed that noise control can be accomplished at reasonable cost when undertaken in the designing and planning stages. The utilization of existing noise control methods and measures was also strongly urged. In summary, this presentation recommended that:

1. The abatement of noise should be provided for at the design stage.
2. Criteria for protection against hearing loss and speech communication should be developed.
3. Noise specifications should be developed and used in order to limit noise output of new machines and processes.
4. Vibration damping (constrained layer-type) should be utilized to a greater extent to counteract the generation of noise resulting from lighter metals in the construction of machines and their components.

IN TRADES AND SERVICES

Accident Prevention in Trades and Services. The workshop on trades and services opened with an assessment of the current problems in safety. These were stated by the moderator as (1) the impact of accident costs on the small employer; (2) the losses incurred by unscheduled business interruptions; and (3) the effect on the public of accidents in stores, hotels, and restaurants.

A film clip of the Garry Moore show of 1961 illustrated the ease of accident occurrence in an office scene. Despite the fact that the clip was all comedy, it did not fail to make the point that accident potential is ever present. There was general agreement that such a medium of communication was valuable as a method of awakening general awareness.

The role of programs and training in a fairly large hotel with an excellent safety record indicated what could be done to prevent accidents. This hotel, in conjunction with a large industrial firm, has an extensive and complete safety program which has not only the blessing, but also the active participation, of top management. The advantages of such a program were enumerated. Such a policy sets the pace and the tone of the entire organization. Safety meetings at all levels, regular periodic inspections by supervisory as well as outside highly competent safety personnel, thorough discussion of problems, the arousing of general interest of all employees, and of prompt corrective measures in all cases of hazards have resulted in the establishment of a world's record of more than 5 million man-hours without a disabling injury. Their program was presented in detail.

The workshop agreed that more than 90 percent of the trades and services establishments were small. In restaurants, particularly, the number of employees was extremely small, while the number of hazards in the area of food preparation is large. A complete enumeration of the machine hazards as well as exposure to heat and burns along with numerous fire hazards make for high-injury frequency. In this category, the food services rank low in terms of safety achievement. Their rank is 36th among the 41 best trades.

The use of unskilled employees, short-time employment in one location, lack of any training in most instances, and difficulty of carrying on any formal safety program in a firm with six or fewer employees were assigned as probably the most important reasons for the poor record. It seemed to be the consensus of the workshop that a greatly expanded program of service by the various trade organizations would assist in the promotion of better accident prevention. Greater use of insurance engineers was also recommended.

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The problem of preventing accidents to customers and the resultant savings of doing so created considerable interest. It was shown that the saving of insurance costs in public liability could be expected to approximate 25 percent. It was pointed out that in large hotels and department stores, this saving could amount to as much as $500,000 a year to a single establishment.

The suggested program involved: (1) Active management support; (2) complete records and analysis of accident experience; (3) effective loss-prevention programs; (4) a lively, tailormade safety program; and (5) insurance company cooperation. Methods of selling management and maintaining interest in these programs were presented, and a resumé of those which had been successful was presented.

It was the conclusion of the workshop that accident prevention in the trades and services had been neglected because of an attitude that sales increases will solve all expense problems. It also concluded that enough data now exist to show the fallacy of this idea.

The workshop closed with this thought: Management must now produce an action program of accident prevention that will tend to foster increased sales, but that expense control in this field is a *must—now.* Action must start *today—tomorrow may be too late.*

WITH STANDARDS AND CODES

Safety Leadership Through Standards. The main values of standards to State labor departments are in:

1. Training of inspection staff.
2. Gaining acceptance of those who will be affected by enlisting their cooperation and comment in the development of the technical requirements.
3. Obtaining support of legal authorities for regulations that have been developed under the "all parties at interest" procedure.

Industry reported that standards had served useful purposes such as:

1. Serving as a basis for establishing plant safety rules.
2. Insuring that the design of new manufacturing facilities will incorporate the required degree of safety.
3. Aiding plant maintenance.
4. Serving as guides to safety in multiplant operations.

Organized labor indicated a growing interest in the development of safety standards and an increased participation by labor representatives in this work. Safety standards have also been used by labor to

help in the training of shop stewards and in the education of their own safety committees. In certain cases, labor is also in a position to help with the enforcement of certain standards. For instance, in at least one jurisdiction if new electrical installations upon inspection do not meet code requirements, the worker is required to correct the deficiency on his own time. In another case, one union is becoming very much interested in a standard on noise control.

The producers of equipment use "The American Standard Safety Code for the Use, Care and Protection of Abrasive Wheels," as an example of how a safety standard can help to:

1. Simplify design of equipment.
2. Serve as reference data in legal suits on products liability.
3. Reduce the cost of manufacture of equipment because of uniformity of styles and sizes.
4. Reduce the number of accidents through safety design built into the product, thereby reducing both insurance and production costs.

The audience participation part of the meeting indicated that there was an increased tendency for products to be labeled to conform with national standards or to be approved by testing laboratories such as those maintained by the U.S. Bureau of Mines and Underwriters' Laboratories.

IN MANUFACTURING

Stimulating Safety Leadership in Manufacturing. This workshop presented success stories of achievement and leadership in a variety of manufacturing industries. The injury rates in manufacturing are *lower* than those of most other industries. In prior conferences, other industries have been urged to *emulate* manufacturing! Nevertheless, there are some signs that manufacturing rates are on a *plateau*, and there are some *high rate* industries within the manufacturing category.

The Need for Association Leadership

Continuous attention to problems relating to safety is essential. The mere fact that a good record is attained one year does not mean that work in this area can be relaxed. Actually, more determined efforts and new approaches are in order to maintain enthusiasm.

It was shown how periodic deemphasis by a trade association has affected the safety records of its members. During the last 10 years, the lowest frequencies of member companies have followed periods of greatest safety activity by the association. On the other hand, the

overall frequency of the companies represented by the association tends to climb during times when activity is lessened.

Before and after comparisons showed the effect of exposure to a national safety program upon companies which have never previously participated; and presented examples in which changes in individual company policy toward safety had an unfavorable effect upon its overall record.

Key Men—Another Tool

In a plant with 5,000 plus people, standard safety program elements, including a highly trained supervisory force, had brought the plant's injury rate down to an "average" plateau. Study revealed that the supervisor's duties of planning, recording, etc., did not permit him to give the immediate work supervision which used to be given by a "labor foreman."

A group of 160 unofficial leaders—top operators, leadmen, first hands, and technicians—was recruited and trained. As "key men" in the safety program, they were asked to take training (on an overtime basis) and apply it at the worksite. A 21-percent improvement in injury experience resulted. When another 175 men were recruited and trained, a 39-percent improvement resulted. After a third group of 40 was trained, the accident rate was down 65 percent in 2 years.

The key man program utilized a group of "natural leaders" to bridge the gap in a vital communication line. Safety communications started at the top, but did not get below the supervisory level. They never quite reached the workers who were getting hurt. Now the gap is closed. Communications go all the way from top to bottom—and back to the top.

The Safety Workshop

A panel of five experts showed how they conduct informational workshops as part of their trade associations' safety programs. In addition to explaining how the workshops are run, the panel members provided their individual suggestions and answers to a wide variety of audience questions. Some topics concerned—

1. Indoctrination of new employees.
2. Sources of information on hazards of chemicals.
3. Methods of safeguarding new processes.
4. Qualities to look for in a safety engineer.
5. Controlling the constantly changing hazards of maintenance work.
6. Labeling hazardous materials.

7. Transportation emergency instruction cards for truckdrivers hauling dangerous chemicals.
8. Methods for enlisting employee cooperation and participation.
9. Awards, rewards, and penalties.
10. Examples of industrial civil defense relationships with disaster planning, and the regular safety and fire protection programs.
11. Small plant safety programs.

The meeting closed with a charge to exercise personal leadership at all levels in order to mobilize business and union leaders, association and governmental leaders, and, in fact, leaders in all walks of life—each of whom can take steps to ensure safety in his work, his driving, his home, and his recreation, and can influence others.

Part III

Human Aspects of the Accident Barrier

"Human Aspects of the Accident Barrier" (l. to r.) Dr. Leon Brody, New York University; Dr. Hans Selye, University of Montreal; Dr. S. I. Hayakawa, International Society for General Semantics; and Dr. Howard A. Rusk, New York University.

Introduction

Dr. Leon Brody, *Director of Research, Center for Safety Education, New York University*

A half century ago the great Danish physicist, Niels Bohr, opened the way for a theory of matter—quantam mechanics—that in the words of a noted British scientist "explained most of physics and all of chemistry." To this a great American physicist added, "and therefore all of life."

Theoretically, and eventually, that could prove to be the case. Practically, and at present, most human behavior eludes quantification and resists mechanistic approaches. People, fortunately, are still people. Yet this same fact does give us some cause for concern. It is indeed one of the reasons for this Conference.

For sometimes people do things against their better judgment, sometimes their judgment is uneducated, and sometimes they just don't bother to judge. In such situations accident potential increases.

Now when people do things against their better judgment, or without active, responsible thinking, the chances are that they are under stress of some kind—physical, chemical, emotional, or in some interactional sense.

When they use limited judgment in coping with a hazardous situation, or for want of good judgment help to precipitate a hazardous situation, the chances are that the why, what, and how of safety just have not gotten through to them adequately.

And incidentally, when accidents do occur as a result of such faults or conditions, it is likely that this experience *can* be used to motivate people realistically toward relatively safe behavior.

These observations, and the reference in the theme of this session to an accident "barrier," are not intended to suggest that little progress has been made in occupational safety. Indeed, checking the work-injury frequency rates reported by the National Safety Council since 1926, one is impressed by the very substantial reduction from 32 injuries per million man-hours worked that year to about 6 in recent years.

So dramatic a trend can hardly be attributed to chance. Rationally, it must be associated with the efforts of professional safety workers. The roster of these workers runs the gamut from engineers

and educators to psychologists, medical personnel, and other specialists in management and labor.

But what about the leveling-off of progress that has been in evidence now for more than a decade? I suppose one explanation lies in the fact that the better we get, the more difficult it is to get better. On the other hand we must recognize that complacency is safety's No. 1 enemy. We must not be satisfied with status quo, we cannot rest on past accomplishments. Our rapidly changing times will not permit that. And regardless of change, accidental loss of life and human suffering belong in the dark ages. As for the economic costs of accidents, the many billions of dollars involved annually could do so much in education, in cancer research, in business improvement, and in helping to meet other vital needs of our country and its people.

So we need to continue and intensify our present efforts on behalf of safety. And we need to look in new directions too . . . to discover what knowledge may be pertinent in research and practice in other areas of endeavor that do not bear the specific "label" of safety, yet may contribute to accident prevention and control. For if human failures or shortages characterize most accidents, it should also be borne in mind that human failures or shortages are a common concern of science, technology, and the humanities.

This unity of knowledge and purpose is exemplified by your presence here today. You variously represent many different branches of science and many different areas of practice. But you have a common objective, the advancement of safety, and during the past 2 days you have been seeking useful knowledge or insights from each other and from many Conference speakers. The distinguished speakers you are about to hear are also in different fields. But they have much to contribute to our common objective.

The Stress of Life—New Focal Point for Understanding Accidents

Dr. Hans Selye, *Director, Institute of Experimental Medicine and Surgery, University of Montreal*

It was indeed a signal honor to receive an invitation to address the final plenary session of this Conference. Yet, I must admit that at first, I could not understand why I was invited nor how I could possibly accept, since my work is limited to basic research on laboratory animals and these are hardly the proper subjects on which to study occupational accidents—lest it be the accidents associated with the occupation of a laboratory rat. Then it occurred to me, however, that presumably I owe the honor of this invitation to the fact that my associates and

I are principally involved in studies on the mechanism of the body's response to stress, the nature of the "wear and tear" of life and its cumulative end-result which manifests itself as aging.

In the various conferences and workshops of this meeting, others have discussed the measures that are likely to reduce the accidents to which this or that profession is especially subject, but surely a conference of this kind should also consider the basic biological conditions most likely to create accident-proneness, namely, stress and aging. It is hardly necessary to point out that men whose reactions are impaired by any kind of stress (emotional, tension, physical fatigue, disease), or advanced age, are particularly prone to accidents. Hence, a brief outline of what we have learned about the nature of stress and aging, and what we can reasonably expect from further basic research along these lines, is undoubtedly a proper concern of this meeting.

Now, just what is stress? Although we hear much talk about the stress of life nowadays, most people would be hard put to define it. The financier worrying about the stock exchange, the laborer or the baseball player straining his every muscle to the limit, the journalist trying to meet a deadline, the patient fighting a fever, all are under stress. But so is the baseball fan who merely watches an interesting game, and the gambler who learns suddenly that he has won a million dollars. Stress is not always due to something bad, nor is it always bad for you. Stress is the rate at which we live at any one moment. All living beings are constantly under stress and anything, pleasant or unpleasant, that speeds up the intensity of life causes a temporary increase in stress, the wear and tear exerted upon the body. A painful blow and a passionate kiss can be equally stressful.

The word "stress" has long been used by laymen to designate tension, fatigue, or exhaustion, but it was not until recently that physicians began to realize that stress can be scientifically analyzed and objectively appraised by certain characteristic changes in the structural and chemical composition of the body. At the same time, we learned that stress does not consist merely of damage, but also of adaptation to damage, irrespective of what causes wear and tear.

It might help to explain the essence of stress, as we now understand it in medicine, if I briefly related the circumstances under which I first stumbled upon what I later called the *stress syndrome*. (A syndrome is a group of changes which tend to appear conjointly.)

I had just completed the preclinical subjects required at that time in medical school as preparation before ever seeing a patient. Then, finally, came the great day when we were to hear our first lecture in internal medicine and see how a patient should be examined. By way of introduction, we were shown several instances of the earliest stages

of various infectious diseases. Each of these patients felt and looked ill, had a coated tongue, complained of fatigue, with more or less diffuse aches and pains in the joints, intestinal disturbances, loss of weight and appetite, etc. All this was quite evident to me but the professor attached very little significance to any of it. He enumerated only a few "characteristic signs" which might help us in the diagnosis of disease. These I could not see. They were either still absent or at least so inconspicuous that my untrained eye could not distinguish them. Yet, we were told that these were the important changes to which we would have to give all our attention. The professor explained that, at this early stage, most of the specific, typical diagnostic signs were not yet evident, and until they appeared not much could be done. Without them, we could not tell precisely what the patient suffered from and, hence, it was quite impossible to recommend any efficient, specific treatment. I was struck by the fact that the many features of disease which were already manifest, even to me, did not interest our teacher merely because they were "nonspecific," that is, not characteristic of any one disease.

I realized that we had to find typical disease manifestations in order to identify the particular cause of disease in any one patient. This was obviously indispensable before we could prescribe any medicines having the specific effect of killing the germs or neutralizing the poisons that made these people sick. But what impressed me, the novice, much more was that apparently only few signs are actually characteristic of any one disease; most of them are apparently quite common to many, or perhaps even to all diseases.

I wondered why such widely different disease-producing agents as those of measles, scarlet fever, or tuberculosis share the property of evoking the nonspecific manifestations just mentioned. I also wondered why medicine concentrated all its efforts upon the recognition of individual diseases and the discovery of specific remedies for them, without giving any attention to the much more obvious *syndrome of just being sick*. The patients we had just seen had a syndrome, but this seemed to be the syndrome that characterized disease as such, not any one particular disease. Would it be possible, I asked myself, to analyze the mechanism of this ubiquitous syndrome and, perhaps, even to find drugs which act against the nonspecific factor in disease?

However, it was not until about 10 years later that I managed to put all this into the precise language of experimental science. In 1936 at McGill University, we were trying to find a new ovarian hormone in extracts of cattle ovaries. All our extracts, no matter how prepared, produced the same syndrome, characterized by an enlargement of the outer part or "cortex" of the adrenal (a hormone-produc-

ing or endocrine gland, situated just above the kidney on each side), gastrointestinal ulcers and involution of the lymph nodes and the thymus (a lymphatic organ in the chest). At first, I ascribed all these changes to the hypothetical ovarian hormone we were looking for, but it soon turned out that extracts of other organs—in fact, even toxic substances of all kinds, cold, heat, X-rays, or infections—produced the same changes.

Then, I suddenly remembered my classroom impression of the "syndrome of just being sick." In a flash I realized that what I had produced with my impure extracts and other damaging agents was an experimental replica of this condition. This model was then employed in the analysis of the stress syndrome, using the adrenal enlargement, gastrointestinal ulcers, and thymicolymphatic involution as objective indicators of stress. These reproducible and measurable indicators formed the basis for the development of the entire stress concept as we see it today.

It gradually became evident that any agent that demands an increased vital activity, automatically elicits a nonspecific defense mechanism which raises resistance to stressful agents.

(It should be mentioned parenthetically that in physics, stress is the condition existing in elastic material when the strain of an external force acts upon it. Had my English been better at the time, I should have called my phenomenon the "strain syndrome" and that which causes it, "stress." However, I did not realize the difference and by the time I did, the word "stress" had been too generally accepted in medicine to make a change, so I had to invent the term "stressor," which is now in use for the agent that causes physiologic stress.)

The whole stress syndrome or "General Adaptation Syndrome" (G.A.S.) evolves in three stages: (1) the "alarm reaction" during which defensive forces are mobilized; (2) the "stage of resistance" which reflects full adaptation to the stressor; (3) the "stage of exhaustion" which inexorably follows as long as the stressor is severe enough and applied for a sufficient length of time, since the "adaptation energy" or adaptability of a living being is always finite.

An important part of the stress-defense mechanism is an increased secretion by the hypophysis (a small gland at the base of the brain) of the so-called adrenocorticotrophic hormone (ACTH) which, in turn, stimulates the adrenal cortex to produce a group of hormones which I have called the "corticoids." Most important among the latter are the anti-inflammatory "glucocorticoids" such as cortisone, and the pro-inflammatory "mineralocorticoids" such as aldosterone and desoxycorticosterone. These hormones are essentially useful but derailments in their production can lead to maladies which I called

diseases of adaptation because they are not directly due to any particular pathogen (disease producer), but to a faulty adaptive response to the stress induced by some pathogen. For example, when too much of the anti-inflammatory cortisone type of hormone is present, infections or gastrointestinal ulcers develop easily.

Of course, hormones are not the body's only defense against stress. The production of other chemical compounds and the reactions of the nervous system are also of great importance; but these mechanisms are likewise subject to error and can thereby precipitate disease. In this sense, certain nervous and emotional disturbances, high blood pressure, certain types of rheumatic, allergic, cardiovascular, and renal diseases are also diseases of adaptation.

Being the rate of the wear and tear of life, *stress cannot and should not be avoided.* The art is to learn how to live a full life with a minimum of wear and tear. All machines wear out to some extent during use and the human body is no exception. But the intensity of use is not strictly paralleled by the severity of the wear and tear. A few drops of oil can give much protection to an axle under physical stress, and the same is true of certain hormones and nervous reactions when the body is under the stress of life. The secret is not to live less intensely, but more intelligently. Friction and strain beyond its capacity are the worst enemies of the inanimate machine, although an appropriate amount of use helps to keep the rust out. Here again, the situation is very much the same in the living machine of the human body: the frustrating frictions of fighting the unavoidable and the effort to perform tasks beyond our capacity are the greatest sources of wear and tear, but the stress of using our mind and muscles within the limits of their capacities is healthy, pleasant, and indeed indispensable to keeping fit. Man's noblest aim is to express himself as fully as possible according to his own lights. Each of us must find his innate stress level and live accordingly. Compulsory inactivity may cause more stress than normal activity. I have always disagreed with those doctors who, for some minor ailment, would send an ambitious business executive to a long and enforced exile in some health resort, to relieve him from stress by absolute inertia. High-strung men often become much more tense when they feel frustrated by not being allowed to pursue their usual interests.

While analyzing stress in my experimental animals, my colleagues, my friends, and myself, I have tried to summarize this philosophy in a little motto. It sounds as trivial as a nursery rhyme, but it is based on solid biologic laws—and, at least in my case, it works:

"Fight for the highest attainable aim
But do not put up resistance in vain."

We should fight for whatever seems really worth while to us, but we must avoid the horrible stress of frustration, by aiming only for things that are attainable. Resistance should be put up whenever there is reasonable expectation of success, but never if we know it would be in vain.

As I have explained elsewhere (*The Stress of Life*) in greater detail, it takes practice and constant self-analysis to live by this motto. Any time during the day when I begin to feel keyed up, I consciously stop to analyze the situation. "Is this really the best thing I could do now," I ask myself, "and is it really worth the trouble of putting up resistance against counterarguments, boredom, or fatigue?" If the answer is "No," I just stop; or whenever this cannot be done gracefully, I simply "float" and let things go on as they will, with a minimum of active participation (e.g., during most committee meetings, solemn academic ceremonies, and unavoidable interviews with uninteresting visitors). Few people will contest the soundness of this motto; the trick is to follow it consistently in practice.

When suitably handled, *stress cannot only produce but also prevent disease.* This has been amply substantiated by objective animal experiments. We found, for example, that in the rat, inflammation and allergic reactions can be inhibited by exposure to stress. Here presumably, an increased secretion of anti-inflammatory corticoids is the decisive factor.

More recently we found that following suitable pretreatment (with certain corticoids and sodium salts), it is possible to produce fatal heart accidents in animals by merely exposing them to the stress of forced muscular exercise, cold or heat. This furnished us with a useful experimental model for the study of sudden cardiac death. Furthermore, we found that if the rats are exposed to stress prior to this sensitizing pretreatment, subsequent exposure to stress causes no cardiac death. Apparently, pretreatment with stress offers protection because only unaccustomed stress triggers cardiac accidents. Curiously, it does not make any difference which stressor is used for pretreatment; they all offer protection against the production of heart lesions by subsequent treatment with any other stressor. Here, it is evidently not just specific inurement to one agent that counts, but the production of stress by any means. Muscular exercise and cold baths proved to be especially useful protectors because they are well tolerated. These findings throw some light upon the apparent contradiction in the recommendations of physicians, some of whom warn that muscular exertion can precipitate heart accidents, while others prescribe exercise as a protective measure. Presumably, both schools are right, gradual training protects, while sudden, unaccustomed effort can be harmful.

Further studies with our model showed that heart accidents can be prevented not only by pretreatment with stressors, but also by certain potassium and magnesium salts. The protective value of these compounds is now under examination in several clinics. While it is still too early to draw definite conclusions, preliminary results are encouraging.

The fact that the heart can be specially sensitized or desensitized to stress-induced damage was also of theoretic interest. It has always been puzzling that stress should produce different "diseases of adaptation" in different individuals. Now, we had learned that certain sensitizing factors can specifically expose one or the other organ to the destructive action of stress. It is presumably because of such conditioning factors (diet, genetic predisposition, previous exposure to damage) that the same kind of stressful life experience can cause a heart accident, a duodenal ulcer, or a rise in blood pressure in different people.

At present, much of our research at the Universite de Montreal is concerned with the relationship between *stress and aging.* While stress results from the wear and tear incident to increased demands of life at any one moment, aging appears to be related to the cumulative effect of all the stressors encountered during a lifetime. To study aging in the laboratory, we again needed an experimental model. Last year we found that, in animals, chronic treatment with vitamin-D derivatives produces a syndrome which in many respects resembles aging. There develop: arteriosclerosis with calcification of the arteries, wrinkling of the skin, a hunchback, loss of muscle substance, shrinking of the sex organs, and many other changes characteristic of old age. As far as we can see, all these changes are closely related to a derangement in calcium metabolism and, at least in animals, we have learned to prevent them with certain metallic compounds, such as the iron dextran that has been so successfully used in the treatment of certain anemias. This protection appears to depend upon a phenomenon known as *calciphylaxis* through which the body can either produce or prevent the calcification of soft tissues, depending upon the circumstances.

It has long been known that in old people the bones become brittle because they lose calcium, while soft tissues (blood vessels, cartilages, etc.), tend to become calcified. In our model, this type of calcification is associated with changes characteristic of senility and when calcification is prevented, the other manifestations of "premature aging," likewise fail to occur. Meanwhile, however, our work on calciphylaxis has been limited to experimental animals. Only future clinical research will be able to show to what extent, if at all, these findings can help us

to deal with the problem of tissue calcification and premature aging in man.

As we look back upon the development of stress research since the first description of the "General Adaptation Syndrome" in 1936, a number of *practical applications* are already evident and others appear to be within reach. Originally, the corticoids were not considered to be of great clinical significance since they were thought to be of value only in the exceptional patient whose adrenals are destroyed. A powerful inducement to prepare such compounds was furnished by the discovery that corticoids raise resistance to stress in general and influence the process of inflammation, which plays an important role in many diseases.

We have also learned to determine the concentration of "stress hormones" in the body and numerous tests have been developed for the objective assessment of stress which has diagnostic value. Since we have shown that stress cannot only produce but also prevent disease, much research is under way to explore the chemical basis of this protection.

It would be impossible to discuss all these points in detail without entering into complex technicalities. This brief résumé is merely intended to point out the essentials: the definition of stress, its mechanism, and its participation in health and disease. The concept of stress is of theoretical interest in understanding one of the fundamental manifestations of life. From a practical point of view, most of the fruits of stress research can be used only by the trained physician, but everybody can profit by fashioning his philosophy, his way of life, according to the principles just discussed.

This conference was called "to devise voluntary action to reduce the Nation's continuing annual toll of nearly 14,000 occupational deaths and 2 million disabling injuries, estimated to cost $5 billion." We have learned a great deal about the immediately practical measures that can be taken to reduce certain particular types of accidents. I should like to hope that my remarks will help to direct attention also to the urgent need for organized support of research on stress in relation to accidents. For just as there is a "*syndrome of just being sick*," so there seems to be a "*syndrome of accident involvement*." As you know, similar "symptoms" have been reported to characterize the behavior or condition of many different kinds of workers who meet with accidents. The construction worker, the lathe operator, the truckdriver, the laboratory scientist—all are at times subject to unusual fatigue, mental preoccupation, emotional disturbance, and physical disorders that tend to affect performance on the job, even to the point of danger. These are phenomena influenced by stress. Different as they appear on

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the surface, they may nevertheless have common underlying mechanisms. Scientific investigation has already yielded much information concerning such basic mechanisms. With expanded research on stress, we may look forward to more definitive understanding of its role and control in health and disease, and therefore in safety.

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Making Safety Meaningful: Conditions of Success in Communication

DR. S. I. HAYAKAWA, *International Society for General Semantics, San Francisco, Calif.*

Dr. Brody, ladies and gentlemen. Dr. Brody has mentioned that my field is semantics, and I think it is necessary to give a quick statement of what that is about in order to orient you to the kind of material I want to present. There are many misunderstandings about semantics, which is often confused with "ceramics," and I often have to explain that ceramics is pottery and semantics is "crackpottery." This reminds me that once I was introduced as a professor of Semitics, and a lady looked at me dubiously and said, "He doesn't look Jewish to me."

Perhaps the best way to explain semantics is to put it in the context of other disciplines. When you study the relationship of words with other words to form sentences, you are in the study of grammar, are you not? Then when you study the relationship of sentences to each other to form an argument or an exposition, you are studying logic. When you are studying the relationship of entire utterances to the world, which is the subject matter of those utterances—when you study the relationship of words to the nonverbal reality—that we call "semantics."

Then there is a more general field still. There is a field of general semantics, which I am concerned with, in which we study not only the relation of words to the nonverbal territories for which the words stand, but also the relationship of the speaker to the words and the words in their relationship to the listener, and then the interaction of the listener and the speaker. Therefore semantics, general semantics especially, becomes the study of the entire communicative process, which means finally the processes of evaluation and interpretation by means of which we take the complex of the world around us and organize that complex into signs and symbols to code our experiences in order to communicate.

Let me introduce the name of Benjamin Lee Whorf, who was an insurance executive in Hartford, Conn., and also an authority on American Indian languages. He died in 1941, at the age of 44. Under the guidance of Edward Sapir, the great American linguist, Whorf became a student, first of all of American Indian languages, and later on he went into the study of Mayan and Aztec. Also, as I say, he worked for an insurance company. In 1940, his first papers on the relationship between language and thought began to come out in the "Technology Review" of MIT. These papers immediately created a sensation among the semanticists, and I know that Alfred Korzybski, the general semanticist in Chicago at that time, used to recommend the Whorf papers to all his students.

Professor John B. Carroll of Harvard University brought the Whorf papers together in a volume called "Language, Thought, and Reality," published in 1956. There is an important way in which Whorf's ideas have relevance to the concerns of this Conference. Let me quote directly from Whorf: "It was in the course of my professional work for a fire insurance company, in which I undertook the task of analyzing many hundreds of reports of circumstances surrounding the start of fires, and, in some cases, of explosions. My analysis was directed toward purely physical conditions, such as defective wiring, presence or lack of air spaces between metal flues and woodwork, and so on, and the results were presented in these terms. Indeed it was undertaken with no thought that any other significances would or could be revealed. But in due course it became evident that not only a physical situation, qua physics, but the meaning of that situation to people was sometimes a factor, through the behavior of the people, in the start of a fire. And this factor of meaning was clearest when it was a linguistic meaning, residing in the name or the linguistic description commonly applied to the situation." In short, we imagine that we observe directly, but the way in which we see the world is determined by language.

To give an example—"Around a storage of what are called 'gasoline drums' behavior will tend to a certain type, that is, great care will be exercised; while around a storage of what are called 'empty gasoline drums,' it will tend to be different—careless, with little repression of smoking or tossing cigarette stubs about. Yet the 'empty' drums are perhaps the more dangerous, since they contain explosive vapor. Physically the situation is hazardous, but the linguistic analysis suggests lack of hazard. The word 'empty' is used in two linguistic patterns: (1) as a virtual synonym for 'null and void, negative, inert,' (2) applied in analysis of physical situations without regard to, e.g., vapor liquid vestiges, or stray rubbish, in the container. The situation is

named in one pattern (2) and the name is then 'acted out' or 'lived up to' in another (1), this being a general formula for the linguistic conditioning of behavior into hazardous forms." So what concerns us is how we name situations and therefore how we act towards them—because sometimes the naming is entirely inadequate. A further example Whorf gives is this: "In a wood distillation plant the metal stills were insulated with a composition prepared from limestone and called at the plant 'spun limestone.' No attempt was made to protect this covering from excessive heat, or the contact with flame. After a period of use the fire below one of the stills spread to the 'limestone,' which to everyone's great surprise burned vigorously. Exposure to acetic acid fumes from the stills had converted part of the limestone (calcium carbonate) to calcium acetate. This when heated in a fire decomposes, forming inflammable acetone. Behavior that tolerated fire close to the covering was induced by use of the name 'limestone,' which because it ends in 'stone' implies noncombustibility."

These are then the firsthand examples that Benjamin Lee Whorf collected to illustrate his theory that the way in which we formulate our experience, our perceptions, governs our behavior toward them, and our linguistic formulations are frequently inadequate. "A huge iron kettle of boiling varnish was observed to be overheated, nearing the temperature at which it would ignite. The operator moved it off the fire and ran it on its wheels to a distance, but did not cover it. In a minute or so the varnish ignited. Here the linguistic influence is more complex; it is due to the metaphorical objectifying (of which more later) of 'cause' as contact or the spatial juxtaposition of 'things'—to analyzing the situation as 'on' or 'off' the fire. In reality, the stage when the external fire was the main factor had passed; the overheating was now an internal process of convection in the varnish from the intensely heated kettle, and still continued when it was 'off' the fire."

Another example—"A tannery discharged waste water containing animal matter into an outdoor settling basin partly roofed with wood and partly open. This situation is one that ordinarily would be verbalized as 'pool of water.' A workman had occasion to light a blowtorch nearby, and threw his match into the water. But the decomposing waste matter was evolving gas under the wood cover, so that the setup was the reverse of 'watery.' An instant flare of flame ignited the woodwork and the fire quickly spread into the adjoining building."

For another example: "Beside a coal-fired melting pot for lead reclaiming was dumped a pile of 'scrap lead'—a misleading verbalization, for it consisted of the lead sheets of old radio condensers, which still had paraffin paper between them. Soon the paraffin blazed up and fired the roof, half of which was burned off." And in concluding this set of examples, Whorf writes: "Such examples, which could be

greatly multiplied, will suffice to show how the cue to a certain line of behavior is often given by the analogies of the linguistic formula in which the situation is spoken of, and by which to some degree it is analyzed, classified, and allotted its place in that world which is to a large extent unconsciously built up on the language habits of the group. And we always assume that the linguistic analysis made by our group reflects reality better than it does."

Now in further pursuit of this idea, let me mention another writer. In an unpublished paper (and I know this paper is unpublished because it was submitted to me for publication: I am the editor. I accepted it, but it has not yet appeared), Chester Dolan of Long Beach, Calif., writes that to prevent accidents we do the following things:

1. We make changes in things—that is, we put guards around machinery; we put fences around excavations; we put nets under trapeze artists, and so on.

2. We condition reflexes—that is, we hold fire drills; we offer driver education courses; we practice lifesaving procedures, and so on.

3. We may manipulate symbols—that is, we have education campaigns and safety education. We hang posters, we repeat slogans, or we may work out rules of behavior which are, of course, linguistically formulated rules, like highway speed limits, or work rules in the shop or plant. These are the three main approaches to accident prevention.

"But," says Mr. Dolan, "usually we neglect one other method of reducing accidents that is even more basic. We may reduce accidents," he says, "by learning more about our own mental processes." In the study of mental processes, we learn (and now I quote from the standard modern scientific epistemology as well as from people like the transactional psychologists) that the objects of the world around us are not given in nature. What we experience as objects, of course, are the products of the interaction of our own nervous systems with the world of process out there. "Out there," as we all know, there is no solid matter; it only looks solid to us relative to the size and grossness of our nervous systems. Objects in a sense are constructs of the mind as the result of its interaction with something out there. Objects are what we abstract and organize from the buzzing confusion of sense impressions with which we are confronted from moment to moment, from day to day. Out there, there are only energies.

And how do we construct these objects of our experience? As Benjamin Lee Whorf said, "The flux of experience is organized by our minds," which means in turn that it is organized by the linguistic systems in our minds." The Whorfian hypothesis says that if the linguistic system in your mind happens to be Hopi Indian, or Japanese, or Hindustani, the world you construct as you look at it may be different from the world you would construct if you were a speaker of

English. There is no one-to-one correspondence between the words in one language and the words in another. Each language has its own way of abstracting, constructing, organizing the world that is experienced.

Now, because we are trained to use the English language as we are, we look around the world and we see what we feel are familiar objects—there's a drug store; there's a cemetery, over there; there's a white man; there's a Negro; there's an empty gasoline drum; there's a pool of water—and being able to name all these things, we feel at home in a known world. But sometimes the world as we interpret it is so different from the world as it is that the difference can be disastrous.

Chester Dolan reminds us of the salt that was used in place of sugar in a baby formula in a hospital in Binghamton, N.Y., a few years ago, which resulted in the deaths of several infants. There is also the abandoned box in the highway that was run over by a truck because it was assumed to be empty. It contained two children. There are the plate glass windows that people walk through because they assume they are openings when they are not. As Mr. Dolan says, "To understand that what we look at is not what we see is truly the beginning of wisdom." To understand that what we see often omits details vital to our well-being is basic to safe behavior. Many lives would be saved each year if we were all fully aware that our object world is only mental and that like all mental phenomena is subject to error.

Alfred Korzybski, the author of *Science and Sanity*, used to say that all we know is abstractions. The world is process, the world is energy. The object world that we see and touch and experience with our senses is also an abstraction from the full complexity of what is there. The further verbalizations we make about our experience are still further abstractions. So in answer to the general question, "What do you know?" the correct answer would be, "All I know is abstractions."

Korzybski called his system of general semantics, "a training in applied epistemology—an applied theory of knowledge," and he said that the most dangerous things in life are the *characteristics left out* in any abstraction. We must omit characteristics in order to make abstractions at all, but we often are unaware of this fact. Therefore, he said, always to be conscious of the characteristics left out, always to be conscious of the process of abstraction, is at the root of sane behavior. Only thus can we guard ourselves against errors of interpretation and evaluation to which we are all prone. What is suggested by the writings of both Whorf and Dolan is that education in

general semantics—which is after all an education in epistemology applied to the interpretation and evaluation of our experiences in life—is inevitably a contribution to safety education.

How is this education achieved? Does this mean that everybody who works in a factory ought to have a course in semantics? I don't think so. Does it mean that all safety engineers might have a course in semantics? Well, that is more within the realm of possibility, although that still is far out. But I cannot help thinking that at least a significant number of people involved in safety education should know enough about general semantics, know enough about the interactive process of the human nervous system with the world outside, so that in their safety campaigns and in their educational efforts there would be an acknowledgement and a recognition of the semantic factor. Training and experience in group discussion, in group dynamics, in role playing, and other such advanced modern methods of psychological and attitudinal reorientation are also important contributions to safety education, and Dr. Leon Brody has already written on this subject. I think it is very important because what happens, after all, as a result of such interactive process of education, such as group discussion, is that you learn inevitably that your abstractions about the world are not necessarily the abstractions made by some other person and that other people include characteristics in their abstractions that you have left out; you include some characteristics that they have left out, and as a result of communicative interaction we all begin to understand a little better the abstractive nature of our learning process, of our process of knowledge, and, therefore, become less dogmatic and more open to information.

So, let me wind up by saying that the most important kind of safety education, and perhaps the most important kind of education in general, is education to the effect that the world as I see it, the world as I talk about it, is not the world—it is only the world as I see it.

REFERENCES

Chester Dolan, "'Object' Lesson for Accident Prevention." Scheduled for publication in *ETC.: A Review of General Semantics* early in 1965.

S. I. Hayakawa, *Language in Thought and Action*, 2d ed. New York: Harcourt, Brace and World, 1964.

Alfred Korzybski, *Science and Sanity: An Introduction to Non-Aristotelian Systems and General Semantics*, 4th ed. Lakeville, Conn.: Institute of General Semantics, 1958.

Benjamin Lee Whorf, *Language, Thought, and Reality: Selected Writings of Benjamin Lee Whorf*, ed. John B. Carroll. New York: John Wiley and Sons, 1956.

Making Safety Motivate: The Personal Importance of Accident Avoidance [1]

DR. HOWARD A. RUSK, *Director, Institute of Physical Medicine and Rehabilitation, New York University Medical Center*

Dr. Brody, ladies and gentlemen. I do appreciate the privilege of having been invited here to discuss some of our mutual problems. As Dr. Brody has said, my primary interest is in rehabilitation of disabled people. We now talk about this as the third phase of medical responsibility; the first obviously being prevention, the second, definitive care, and the third phase is that phase that takes the disabled person back into the best life he can live with what he has left, taking into consideration two factors—first, his disability, but much more important than this, his ability. In the past I am afraid that we have only looked at the disability and not at the potential ability. We are in the prevention business, too. We get your mistakes—the most severe ones, because we don't get patients at the Institute of Physical Medicine and Rehabilitation unless they are very severely disabled—broken neck, broken back, head injuries, multiple amputations, burns, and so forth. Our job is to try to prevent further loss of ability to meet the needs of daily living, to earn a living, to live a useful life, but most of all to prevent the loss of dignity, which is the most precious human possession.

It is hard, and yet it is easy, to understand why we still have the problems that come to us from accidents, and I here would like to congratulate you on the tremendous impact that you have made on this problem, especially in the last decade. It is easy to see why some of the problems continue to exist because we are dealing with human beings as a total, and with it the relative amount of human frailty and human error. It is hard to understand why anybody would not be continuously cautious if they recognize, as you do, that the number one cause of death, above cancer and heart disease, and all the others, from the ages of 1 to 35 is accidents. I read an interesting note just this week which may be old hat to you, but it was new to me—that the most accident prone individual in our civilization here in the United States is the 2-year-old male. Those of you who have children, or who have eight grandchildren as I do, can well recognize the reason for this. It is appallingly higher than any other age group and may be a takeoff point for some new studies in certain psychological facets of the accident-prone, so-called prone, individual.

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[1] A transcript of an extemporaneous speech.

It would seem so easy to require everybody to have seat belts in their cars and wear them every time they take off, if they realized, as you know, that it would prevent 25 percent of the deaths of those riding or driving automobiles, and a great many of the severe injuries.

If Roy Campanella were here today, he would tell you that he would probably be still catching baseball today had he had his seat belt fastened, because Roy has become sort of a missionary in this field to try to let people know what happened to him and why. As you remember, this was a sudden skid on wet autumn leaves in the middle of the night. He was driving alone; he went over the steering wheel and, of course, his head acted as the crack of a whip and his body the lash, and his neck was broken. The cord was severed when he was wedged over the wheel and down just above the cowling.

Roy illustrates, too, that you really can't disable ambition. He has gained nothing at all physically and is still completely paralyzed from the upper chest down, with no movement in his hands except a little motion in his thumbs. He can move his wrists and his elbows. Roy now runs his liquor store. He is a coach for the Dodgers. He has a radio and television program, and probably his most important job is running a Little League baseball group out in Glen Cove, his home.

I must tell you one little anecdote about Roy that is so delightful. This was about the third day he was in the Institute, having been transferred there from general hospital where he had been for about 3 months. I came in his room in the early evening and he had been watching television, still flat on his back, with prism glasses. He had the telephone cocked up on his shoulder, and I could only hear his end of the conversation which went as follows: "Is this the Dodger Clubhouse in Los Angeles? This is Roy Campanella. I want to speak to Joe. Hello, Joe, this is Roy. I've been watching you play baseball this afternoon on television, and you never got no hits. In fact, Joe, I know this, that you ain't had a hit all week, and I just want to tell you this, if you don't pull that right foot back about 6 inches, you ain't never going to hit." Joe pulled his right foot back 6 inches, and he started to hit. This is what you call diagnosis by long distance.

My assigned subject is "The Personal Importance of Accident Avoidance." If I had you all at the Institute today and could walk you through, there would be no problems about your recognizing the personal importance to you and to those for whom you are responsible. I think, too, that you might be heartened to see some of the results even with the most difficult problems. The number of disabled persons that come from civilian life as a result of disease and accident outnumber our disabled veterans, which we thought was our great problem at the end of the war, by about 12 to 1.

I am not going to report a lot of statistics today because you know them better than I, but I will recall two to you that have always put this program in bold relief better than any others to me. The days of our highest casualties in World War II were the 10 days after the landings on the beachhead at Normandy. We lost 11,000 men, killed and wounded, those 10 days. It is estimated that we killed and wounded twice as many people on the highways and in industry during the same 10 days among our civilian population, despite curtailed driving due to gasoline rationing.

The 4 bloodiest days of fighting in World War II were the 4 days at Iwo Jima. We killed and wounded four times as many people in the United States by farm accidents alone in the same 4 days as we lost on the 4 bloody days at Iwo.

Paraplegia was not a difficult problem in World War I. We had 400 cases in the U.S. forces. One-third died before they got out of France, one-third died within 6 weeks after they got to this country, and 90 percent of the last third died within the first year. They were all dead within a decade, I think, except two. This last war we had 2,500. At this time, they didn't die, for with antibiotics and better surgical techniques, and better knowledge of nutrition, they lived. They were strong young men who had given half their bodies to their country. They had good hands. They had good heads, and they wanted to live the best life they could. It is so easy to forget that in 1945, there was no program whatever in the Veterans Administration for this type of problem. Everything was developed after the regime of Gen. Bradley, Gen. Hawley, and Dr. Paul Magnuson, and it started from a dead stop.

Of the 2,500 original paraplegics in veterans' hospitals in those days, 1,783 are driving their own cars and living in their own homes, and 1,500 are at work in competitive industry. But while we got the 2,500 out of veterans' hospitals, the census increased because there was someone, a civilian casualty, to fill every bed. Now, as we analyze the figures of our paraplegic patients, we can say with real assurance to you that 80 percent of these individuals can go back to work in competitive industry, and not only compete but excel. And if you only remember one thing that I say this morning, I would like you to remember this, because this is the key to all rehabilitation. This is why it works, and this is something that I am afraid we forgot, and I think it will be particularly valuable to you in assessing some problems of disability that come back to you.

The reason rehabilitation works is that society today doesn't pay for strength. It only pays for two things: the skill in your hands and what you have in your head. And you don't have to run the 100-yard

dash or do the high jump to be the best lawyer, doctor, potato peeler, elevator operator, or a thousand other jobs that include the Presidency of the United States. But we have considered this false body image of physical wholeness and ability as being synonymous, and they are not. You can be the fastest runner in town and yet be too stupid to make a good living in competition.

The average person only uses 25 percent of his physical capacities in daily living in our modern society, but the blind man uses 100 percent of his senses of touch and hearing, because with those senses he sees. Put him in an X-ray or photographic dark room and he will turn out a third more work than the sighted, because he is working in the normal environment in which he lives. Put our paraplegics at bench jobs that require upper arm strength and hand skill, and production-wise they will kill the ordinary worker, because there is an advantage to their disadvantage. They are working with hypertrophied muscles with which they walk; that is why more than twoscore of the surveys in this country over the last 25 years have shown exactly the same thing. Properly trained and placed, the disabled workers have a better production rate, a lower accident rate, a lower absentee rate, and nine times less labor turnover than their normal counterparts, working side by side with them. They have earned the right not to be second-class citizens and second-class workers.

I am asked all the time, "Well, this program may be for full employment, but what about the time when there is a lot of unemployment? How about these people?" The question infuriates me, and I always answer it in the same way, that we are not asking for the disabled to be put ahead of the starting line of the normal. We also hope that, as in the past, they won't be 50 yards behind. Let everybody start at the same starting line—in competition. We know that our people can compete, even above the so-called normal. And any time in this country, or any other country, when the normal can't compete with the disabled, then I am much more interested in the moon flight than I am right now, today.

I think, too, there is real necessity for more action. I'm talking about highway accidents now, and I think that this will only come by public opinion and public action to certain horrible things that happen due to inanition, and I will illustrate this by a case. We have a young 38-year-old surgeon at the Institute who was admitted there 11 months ago. He is a Cuban who came to this country, graduated in medicine, trained in surgery at the Bellevue Hospital under one of the best services in the country, and then went back to Cuba. He escaped after the present regime took over, got back to Florida, and started practicing in a rural area where surgeons were needed badly. While

sitting in his parked car, he was hit by another car. The driver was drunk. He received a head injury that made him aphasic so that he could not speak, and he was paralyzed on one side of his body. He had both legs fractured, both arms fractured, and one hand terribly fractured. Now he is able to get around and about a little bit and his speech is clearing a little. He is still determined that he is going to work in medicine. But the point of the story is that the man that hit him had had a hundred arrests for reckless and drunken driving, and had never been convicted. The doctor is suing the State in which this accident happened because he feels, and I agree with him, that this sort of laxity makes the officials of the State responsible. It will be interesting to see what happens.

I would like to suggest to you that when you go back to your responsibilities, and when you have to replace people, you might find that the disabled would make good safety officers, because this would be a good way to expose people in a delicate way. Now I'm not one who feels that the sophomore class at high school should be marched through the morgue and the sheets thrown back so they could see the mangled bodies and what not; but I would like to see the sophomore class at high school come down and visit their colleague who broke his neck, driving 90 miles an hour in a drag race. I would like them all to come down and see what his problems are, today. And you don't have to say any more. You don't have to be any more vigorous than that. That is why I think that those who have had it and who have come back, you will find, are first deeply sympathetic and extremely careful; and second, they can teach both by precept and by example.

It is interesting, the things that cause disability in various parts of the world. I think you would be interested to know that there are more hands in the world, twice as many hands in the world, disabled from leprosy than from all other conditions known to medicine—arthritis, accidents, everything. And the reason that there are so many isn't because of the deforming direct action of the leprae bacillus. The offender is the brass saucer from which these people drink tea and soup. It is a cold morning, and the soup is poured in these brass saucers hot from the fire. They warm themselves and drink at the same time. They have no sensation in their hands, so their hands burn right down to the tendons and become secondarily infected. Then you are up against it. I think that research of the future in this field is going to take on some very interesting angles.

Dr. Selye's an old friend of mine and I have followed with tremendous interest and admiration his work in identifying and bringing to light all of these various factors in stress. The problems of fatigue—

we saw this illustrated so beautifully during the war in our pilots and air crews who were flying missions, who had to be in one position for many hours. We found that they were also under great tensions. As Dr. Selye has said so many times, in this tension if you can run or if you can fight, you can get relief. Now these people couldn't run, and their fighting consisted of dropping a bomb in a matter of seconds and then trying to get back alive. Their hands had been moist for hours and they had lost electrolytes, and had also burned up their blood sugar. We found out a very simple thing: if we could give them inflight exercises that they could do in position—isometric exercises—and give them enough chocolate bars and advise them to eat them as soon as they got off the mission, that it changed the problem entirely.

I spent 2 days last week at NASA in Houston, and find that the number one problem there, physiologically, is the horribly cramped position that the astronaut must be in for unbelievably long periods of time. And in the experiments there, they are seeing in humans what you have said, Dr. Selye, for these many years, that the deconditioning phenomena of immobilization is so rapid that they are able to measure the loss of calcium in the bone of the heel within 3 days, and 10 times as much in 14 days. This has a point as far as you are concerned—that posture and something to relieve the results of fatigue in posture—we could follow our British friends and—well, we do have coffee, but too often without sugar or cream, and it doesn't help the blood sugar much. It is like taking a little caffeine. But if we can replete our blood sugar in midmorning and midafternoon, I think it would be very helpful.

A new machine has just been devised that will pull nitrogen out of the air and concentrate oxygen in an average sized room from the normal 20.9 percent up to 30 or 40 percent, at a cost of 75 cents a day. In the future, I can see this in certain industrial areas, and certainly in smoky boardrooms when everybody gets so tired and sleepy after lunch that you have to get up and walk around or you have to get out. If you had this kind of increased oxygen for a period of time, it would make all the difference in the world in the way you felt and also the way you cerebrated. The hyperbaric chamber with oxygen concentrated under increased pressure also offers great new ideas and opportunities.

I would like to close by saying that I think what you are doing here and why you are here is probably of greater significance than anything that you do or learn here, because you are here voluntarily to share information with your fellowmen and with those from other countries of the world. Because you want to help prevent the maim-

ing of people, you come and make this material and discussion available to all the world. You have no concern about race, creed, color, or politics. This is a common problem to everyone in the world, so you can really speak a common language in this field with your colleagues from any place in the world. So I like to feel that what you are doing here, in a conference like this, not only helps in the prevention of accidents, the saving of life and of disability, but also, this is one small stone in the total foundation of understanding, without which we could never hope to live together in a peaceful world.

I would like to close by reading you these lines written by one of our great scientists, who had a stroke in his early forties, who lived some 20-odd years after that, who did his greatest work after he was paralyzed, and this was his philosophy of life. I think it is yours, and ours, in this country. And again with gratitude for the privilege of being with you, I leave you with these lines.

> "Not to destroy, but to construct. I hold the unconquerable belief that science and peace will triumph over ignorance and war; that nations will come together not to destroy but to construct and that the future belongs to those who accomplish most for humanity."

And the author was Louis Pasteur.

FROM KNOWLEDGE AND INTEREST TO ACTION AND RESULTS*

Dr. Brody. I wish it were possible to have questions from the audience, but, obviously, our schedule is a very tight one with other speakers to come, and bearing in mind your own travel schedules, we have taken the liberty of confining the interrogation of our experts to questions by two men, who in a definite sense, by virtue of their varied and extensive experience in safety, may be said to represent you, the audience. These two gentlemen, of course, you know. Mr. Leo Teplow is chairman of the Program Committee of this Conference, and incidentally on the program following his name appears the statement: Assistant Vice President, American Iron and Steel Institute. That no longer applies. Mr. Teplow is Vice President, American Iron and Steel Institute. And our other expert interrogator is Mr. Hunter P. Wharton, Vice Chairman of the Program Committee for this Conference, who is also General President of the International Union of Operating Engineers, AFL–CIO. At this point I shall turn the proceedings over to Mr. Teplow and Mr. Wharton.

Mr. Teplow. Before asking any questions, I would like to express my great appreciation, as your spokesman, to Leon Brody for bringing together the galaxy of outstanding men we have heard this morning. It is questionable whether three such eminent authorities have ever been put back-to-back, as it were, as those we have had the pleasure of hearing this morning. Our function, I believe, Hunter's and mine, is to try to bring these theoretical questions to a practical operating level and, therefore, we are going to try possibly to embarrass our speakers by asking them about the application of the theories that they have been propounding to us.

In the case of the study of stresses, the impact of stress on aging and on accident possibilities, I would like to ask Dr. Selye whether in the promotion of accident prevention programs, having done everything we can to sell safety to our people, and finding on occasion our sale is incomplete and that men *do* violate safety rules, is discipline as a final resort in an attempt to promote safety justified from the view-

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*Excerpts from the transcript wherein Doctors Selye, Hayakawa, and Rusk were interrogated by Messrs. Teplow and Wharton.

point of its impact on the individual, or is this one of the undesirable stresses that might contribute to greater accident possibility?

Dr. Selye. After other measures fail, discipline is definitely desirable, in my opinion, not only because it is one more way of enforcing safety regulations, but also because as I tried to point out in my own speech, indecision itself is a great stress. The necessity for making a choice, vacillation, is very stressful. It is much more desirable to follow a discipline—an enforced regulation—than to have to make a choice every time one meets an emergency. I think it is only the leader type, the strong type, that prefers to make his own decision all the time and has to face that responsibility, and it is easier to follow an order of the majority.

Mr. Wharton. Dr. Selye, you indicated that your research has all been with animals, which we realize is a necessary step. Should any precautions that you have found be taken when it comes to generalizing with human beings?

Dr. Selye. It is well to keep in mind that any animal experimentation can be extended to human, but only with great caution. We have to realize that basic progress in experimental medicine can only be made on the basis of animal research, because you could not do dangerous and sometimes painful experiments on human beings. But before that can be translated into clinically operable hints and facts, we have to be very cautious and take into account that not everything that works in animals works in man. However, it is well to understand that almost all major progress in medicine has been based on animal experimentation. You could not use new antibiotics, you could not use new hormone preparations on human beings before you tested them out for possible side effects, contraindications, and dangers in man, and the same is true in stress research. I think many of the aspects of stress research, particularly the treatment with various inflammation regulating hormones, and so on, have been found to apply in man also, although at times with some modifications.

Mr. Teplow. I would like to refer to Dr. Hayakawa's discussion of the meaning of language—what it means to the person who initiates it, and what it means to the person who is presumably the receptor. Dr. Hayakawa, I take the situation of the safety director who usually has a dual problem. Frequently, he feels that he needs to do a selling job, a communications job, with his own management, whether it be in the head office or on the floor—the foreman or the superintendent. On the other hand, he has the job of selling safety to the rank-and-file employees and to their representatives—in most cases, the union that represents them. Is there a difference in the approach a safety director must use in trying to sell his program to management as compared with his approach to rank and file?

Dr. Hayakawa. Is there a difference in approach in selling safety ideas to management, and unions and workers? Is that the question? Well, I should say, of course there is. In selling the idea to management, I would think the most important idea you use is the economic argument—that the lack of safety measures costs the company an awful lot of money, and lawsuits, and trouble, and so on. And in a way, the worker doesn't care if it does cost management a lot of money, but he does care very much whether or not he comes out of his job alive. So I would say there is this basic difference in orientation and motivation of the two groups that must be taken into consideration. I don't know what else there is. Obviously, there are differences in approaches in rhetoric that are the result of talking to the small group in relation to management, and talking to a large number of people in the case of the worker. In the latter case, you have propaganda, a mass persuasion job, and so that would automatically introduce differences in communicating technique.

Mr. Teplow. May I throw in one more question at this point which might be a question so far as the public is concerned? In many of our campaigns on accidents on the roads—highway and traffic accidents—we are repeatedly told the number of thousands of lives that are lost. Yet it appears to me that people as a whole tend to be rather fatalistic, that after all there are a lot of people in this country, and only a relatively few in proportion get killed. Is this the best approach, or might it not be better to use the technique that Dr. Rusk mentioned; namely, the question of injury and its aftereffect, rather than talk about possible death?

Dr. Hayakawa. This is part of the whole problem we have in semantics. Take any kind of statement whatsoever, people treat it as merely words without thinking of the realities for which those words stand. When you say that so many people were injured in accidents, or killed in accidents, the people say, "Tsch, tsch," and that is about all. They fail to visualize what all these statistics stand for. We have this generalized problem in many things other than in safety campaigns, and so in a sense I wonder if this is not basically a literary problem—in academic terms, an English department problem. Now how can we get people to read and understand newspapers, poems, novels, and everything else; not just as words, as recitations, but as standing for complex events inside people's minds, inside people's hearts, and out in the world? The understanding of language in itself, not just as language, but as standing for these events in something that perhaps a literary education should communicate. Scientific education certainly should do this, too. I don't know the answer to this.

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MR. WHARTON. Dr. Hayakawa, in an effort to put over the safety message or communicate it, many posters are used. Some are verbal, some are just plain pictures. Would you care to comment on the effect of that; or in what way we might improve the technique of getting over the safety message?

DR. HAYAKAWA. I think that necessarily verbal messages should be accompanied by nonverbal messages in the form of pictures or something else; also, in addition to the verbal and nonverbal symbols there should be training in specific forms of behavior relative to such and such a machine, such and such an operation, so that one learns these things not only through symbolic mechanisms, but through actual participation, kinesthetically, prophylactically. And that part of education is very important, I think.

MR. TEPLOW. Dr. Rusk, I was very much impressed by your comment about the virtue of taking the sophomore high school class in to see their classmate who had been injured in an automobile accident, and I agree it would be a tremendously effective device. Can you suggest how those of us who operate in an industrial climate can get a similar impact to the rank-and-file employee, so that there might be a greater concern about fellow employees and about self-preservation?

DR. RUSK. Well, I think the first and simplest would be to very quietly urge all of Joe's coworkers, if he is in the hospital and has been in there for 2 weeks, and he is mighty lonesome, to go by and see him. He will tell his own story. There won't be any problem and it will be so simple and indirect that they won't know that it is an educational lesson.

I couldn't help but recall today an incident that happened to me about 5 or 6 years ago. I was giving a commencement address at a medical school in Wake Forest, and I was coming in through the back ambulance entrance to the hospital to go up for a luncheon. As I came in, three ambulances came screaming by, the drivers whitefaced, and all of the attendants came out with stretchers and took three people out of the three ambulances who were dead and two who were just horribly hurt. I said to myself, "Suppose at 11 o'clock on a bright Sunday morning suddenly two patients were brought to this hospital dead with typhoid fever and two others moribund from typhoid fever. You would have 100 doctors flying from all parts of the country, including the Surgeon General from Washington, because of this epidemic, and yet this accident was part of an epidemic."

I find that these terribly mangled cars on the road with signs stating that three people were killed on this curve, has been rather effective for me. Also, I think—and I may be getting in very hot water—that there is a continuing temptation (it is like having diabetes and having

a big bowl of sugar on the table right in front of you at every meal) to have the speed limit at 60 miles an hour and your automobile geared to 120 miles an hour. Especially if you are a teenager and your stress expression is goading you, it seems to me that this is a difficult physical and psychological problem. I don't think we are doing enough to educate, and I think maybe we are doing it too routinely.

I would like to suggest a simple idea. Go to the toy manufacturers of small automobiles and have them put seatbelts on every child's toy automobile. And have the parents say: "You do this and when you come down the hill you won't get hurt. If your car turns over you won't fall out." Then have them go the other way around when they get in the family car. The child puts on his seatbelt and says, "Daddy why don't you wear yours?" I think there is another opportunity to get many more seatbelts installed. I have been interested in a small insurance company in New York. They are so obsessed about this that they wanted to give every policyholder in their company a seatbelt. You know they had a terrible time with State insurance people. They said you can give them a beautiful calendar or anything like that, but you can't give them a seatbelt that costs $4. Well, they finally got permission to do it and it had a tremendous response. People wrote in and they would get a seatbelt, and the second year they would get a second one, or they were urged to buy the second one. Most of them did. If every insurance company in the United States would do this, I think it would be good business. Immediately, we would begin to get protection that we don't have.

I think that there are a lot of things that we must do imaginatively. For example, Roy Campanella did a commercial for this company saying, "If I'd had mine on, I wouldn't be where I am today." May I make one other suggestion, because I am on a one-man crusade about this hazard? We have seen six young people in our Institute in the last 18 months with broken necks from the trampoline. I don't think anybody has any more right to open a public trampolina without someone to supervise and teach people to use it than you have to open a swimming pool and have no lifeguard. And one of the boys, a student from the Far West, had his case adjudicated while he was in the Institute, and he was given a judgment against the trampoline outfit for $600,000. I think that should be a striking lesson.

Mr. Teplow. Dr. Rusk, in connection with what you have been saying, somebody has just handed me a note to this effect. A judge in Jacksonville, Fla., is sentencing teenage traffic accident drivers to spend one or more days as orderlies in the accident ward of a local hospital.

Dr. Rusk. I think it is dandy.

Mr. Wharton. I would like to ask Dr. Rusk if he would care to comment further on this fear technique?

Dr. Rusk. I think it has to be used with judgment. When the self-examination program came out by the American Cancer Society suggesting that every woman in the United States routinely examine her breasts every day, everybody said this is going to make all kinds of neuroses and what not, and maybe this is going to be worse than cancer itself. It didn't prove to be so at all. I think that it has to be done carefully. That is why I think it is stupid to think about taking a high school class through the morgue, but I think it is a dandy idea to have traffic violators work as orderlies and visit their sick friends, etc. I think it has to be done with finesse, and with good judgment, and with reason, and when so done I think it can be very effective.

Mr. Teplow. Dr. Brody, Hunter and I have other questions we would like to ask, but the hands of the clock march on inexorably. So I am afraid that we are going to have to bring this part of the program to a close, if you will summarize.

Dr. Brody. Thank you very much, panel and interrogators. The question of summarizing in a few minutes, and I have just about 5, this morning's remarks on a subject of such tremendous scope and complexity is one that is likely to create a lot of stress in me, Dr. Selye, and I do not care to be a frustrated psychologist. How do you summarize such remarks as have been made this morning and do it in a few minutes? I don't know. I don't think you can do it. I have made a lot of notes, as these pages indicate, and I am going to turn to the very last page.

I know that you, like myself, want more specifics, new information, new facts, specific guidelines, specific recommendations. Well, this may be the age of push buttons, but not of push-button behavior. So if the human element is primarily responsible for the current leveling off of progress in accident reduction, one can hardly expect any 2-hour session, even with the eminent authorities you have heard, to remedy the situation. But, as the President of the United States noted on the opening day of this Conference, the question is not whether we can do the job, but when; for research and experience do suggest that most conditions conducive to accidents are modifiable for most people. The specific applications, however, are really in your hands. The essential requirement is this: informed and forward-looking use of your own imagination in the great variety of fields and job responsibilities you represent.

Leadership for Accident Prevention

W. M. Larke, *Adviser to the Board, Stewarts and Lloyds, Ltd., Bilston Iron and Steel Works, Bilston, Staffordshire, England*

The invitation to address this President's Conference on Occupational Safety filled me at once with very great pleasure, and also a sense of awe at the honour that was being done to me—a foreigner—to take part in a Conference that up to now has been, I believe, exclusively American. I can only say, in all honesty, that my reactions were in that order, a real thrill at the prospect, followed very quickly by the realisation of the responsibilities involved. I can only hope that by the time I have finished, I shall have in some measure justified the confidence reposed in me by Leo Teplow, your programme organiser, and Secretary of Labor Willard Wirtz in extending the invitation.

When preparing the address some weeks ahead of the Conference I had to rely to a large extent on my imagination in selecting the topics, which I considered likely to be of most interest to you, but in this I have been guided by a very happy and fruitful visit to the United States, which I made a few years ago with a colleague, R. P. Barry of the British Iron and Steel Federation. At that time we had the privilege of discussing safety matters freely and frankly with some of you who are actually present today, and with many others at all levels, from the shop floor upwards, that we met during our works visits.

We returned home from that visit encouraged that much of our thinking was common to both countries, stimulated by new ideas that we felt we could use and develop to suit our own particular conditions, and happy that we, in turn, were able to make some suggestions which you thought valuable. We felt that, in spite of the difference in approach in our two countries for both historical and psychological reasons, there is so much common ground between us that we must in the future do all we can to foster the interchange of ideas and experience. I hope and believe that my participation in this Conference is a further step in this direction.

Our two countries have demonstrated time and time again the value of becoming partners and allies in enterprises aimed at securing or defending a better and fuller way of life. Moreover, all the enterprises in which we have been jointly involved have required, and

indeed brought forth, outstanding leadership at all levels, and the very theme of this Conference, "Mobilising Leadership for a Safety Breakthrough" epitomises once again the concept of inspired leadership being a vital factor in the achievement of ultimate success.

LEADERSHIP

General Conditions

What is the nature of this leadership which exerts such a profound influence upon people and upon causes? Each one of us tends, I think, involuntarily, to picture military leaders whenever the subject of leadership is discussed. I suspect that this is mainly because of the glamour and publicity that military leaders receive both for their successes and their failures. It is important to remember, however, that the aims of military leadership are to attain objectives with a minimum of casualties in terms of men and material. These objectives are almost exactly the same as those of leaders in the industrial field whose aims are to run profitable enterprises with the minimum cost in the form of casualties to both people and plant.

The innate qualities of leadership are almost the same in both cases, although the way in which these qualities are exercised will vary markedly from one walk of life to another. It is the methods in which they are employed, rather than the well-known long established qualities of leadership, that are primarily our concern.

This difference of approach, arising from the different historical and psychological backgrounds that I have already mentioned, has given rise to different emphases in our two countries both in the pursuit of safe-working and in other fields. This makes it vital that there must be constant comparison and evaluation of each other's ideas to discover what we may learn, one from the other, and so profitably apply these ideas to the solution of our own problems. It is unfortunately true that in both our countries, and indeed in other highly industrialised nations, a stage has been reached when the great efforts which are being put into the campaign for safe-working are doing no more than barely maintaining the status quo, and it therefore follows that in order to achieve further progress a major breakthrough or innovation is required. New ideas, new techniques, or the novel applications of old ones, are necessary if the efforts being expended are to achieve more fruitful results. Forward-looking leadership has a vital role to play in bringing this about.

Qualities of Leadership

Let us first of all look briefly at the qualities which have been established over the ages as being characteristic of good leadership. Taci-

tus said that, "Reason and calm judgment are the qualities specially belonging to a leader" ("Ratione et concilio propriis ducis artibus"). Reason and calm judgment, however, cannot be effective without self-knowledge, which in turn is the appreciation of one's capabilities and shortcomings coupled with self-control. Furthermore, leadership implies both responsibility and authority or power, however ill-defined that power may be. The poet Tennyson says that "Self-knowledge, self reverence, self-control, these three alone lead life to sovereign power." A leader's responsibility is inescapable, but how and from where a leader achieves his authority or power is perhaps less clear. Tennyson in an extension of the quotation I have just used, suggests that power of itself comes uncalled for and goes on to state that the important thing is to live by law. We might do well to remember that law in its broadest sense, and by this I do not only mean legislation, is both a source of authority and of protection to those called upon to exercise initiative beyond the minimum called for. A leader must enlarge the authority invested in him by law, rank, or position, through the exercise of his own personality and through the possession, at least in some measure, of such varied qualities as integrity of purpose, justice, courage, initiative, imagination, flexibility, humour and human understanding, determination, and patience.

Exercising Leadership

It is the exercise of these qualities which enables a leader to inspire others. It is his inspiration of other people which allows him to delegate his authority, partially, and thereby achieve the success he is seeking, although the ultimate responsibility must always remain with the highest leader. His success will only come through the combined efforts of everyone concerned at all levels—a success that he could not possibly achieve by his own unaided efforts. Inspiration and delegation are the key ideas on which to mount any successful campaign for safety, concepts which are perhaps more fully recognised and acted upon in the United States than elsewhere.

If you care to look in the Book of Exodus, chapter 18, verses 13 to 27, you will find there one of the finest treatises on the art of leadership and delegation that has ever been written. Jethro points out quite clearly to Moses that even the greatest men have their limitations, and urges him set up captains of thousands, captains of hundreds, captains of fifties, and captains of tens. In modern idiom, the advice that he gives could be likened to the setting up of a management structure with a sound communication system, down to about foreman level. So, effective leadership is achieved by different levels of command and of

authority, each one linked to the other in such a way that ideas can flow both up and down.

This implies a plan which is essential for effective action if all efforts are to be coordinated, and the cooperation of all concerned achieved through understanding, which is only possible by good communication. "If the bugle sounds a false note who shall go forth to the battle."

OBJECTIVES

Our overall objective—the elimination of casualties to both people and things—is crystal clear; so is the moon, but it is quite another thing to get there. The distance is the same whether you blast off from Cape Kennedy or Central Russia. The technical problems to be overcome are the same, but an appreciation of their importance and relative effect will depend very much on the knowledge, experience, and indeed the philosophy of those undertaking such an adventure as landing on the moon. We must, therefore, look at the difference in the methods of approach, and perhaps the interpretation of leadership, very briefly to see, as I have said before, what each can learn from the other.

METHODS OF APPROACH

Legislation

Early British industrial history recalls much that is good in the shape of inventions of lasting benefit to mankind, and much also, alas, that is so appalling in the treatment of human beings that it is to us, nowadays, almost inconceivable that such conditions were allowed to persist. There existed, however, even in those dark days, men of vision, leaders, by whose efforts out of those appalling conditions has grown a body of legislation that is, by and large, not only acceptable but recognised as necessary and valuable. Not the least of its values is that in drafting it to suit modern conditions, the limitations of legislation become immediately apparent. Such legislation does give a measure of authority to a leader, and in spite of its limitations this legislation provides, and is seen to provide, a good launching platform from which to put into orbit ideas, plans, and advice, that go way, way beyond anything that written legislation could envisage, let alone enforce. It is from this base of legislation that leaders can, by the exercise of the initiative they must possess, set in motion the voluntary action which provides and maintains the momentum of the advance toward safe-working. This will include the inspiration and encouragement of all those associated with the effort.

Our experience in Britain is paralleled to some extent by your own experience over here, as I was very interested to learn from the chapter

dealing with occupational health and safety in the book "Growth of Labor Law in the United States," published by the U.S. Department of Labor in 1962. I do not want to dwell too much on the legislative aspect because, as I have said, it only forms the foundation from which the major effort must spring, but the fact remains that so far as Britain and most of Europe are concerned, a system has been evolved which goes a long way beyond the actual minimum requirements of the law. To quote the manual of your own National Safety Council, Fourth edition:

> "America in general has failed to produce the type of government-industry relationship found in Great Britain and some other countries, where the Government's factory safety inspectors are considered able, sincere and incorruptible, and where, whatever disagreements there may be, industry accepts government as a strong force in maintaining safety standards."

I would go further and say that at least in Britain a measure of leadership and guidance by the government through the factory inspectorate is welcomed. Because of the mutual confidence which has been built up between both sides of industry and the government, there is always a great deal of discussion between the interested parties, employers and employees alike, before regulations are finalised. This is democracy really at work, and makes for sound realistic legislation. I would go further and say that I believe no government, except in a real emergency, would want or even dare to introduce regulations without this discussion.

By your very presence here today at this Ninth Biennial President's Conference on Occupational Safety, you too, I think, are recognising the need for a lead from the Administration. Your approach, however, is again different from ours, being largely inspirational in character. There is, however, an element of this inspiration in our British relationships in that it is not unknown for factory inspectors to take part in industrial committees set up to discuss particular problems, or even on occasion to take the chair at regional safety meetings between employers and employees.

It will be apparent from what I have just said that there is a considerable difference in attitude between Britain and the most of Europe on the one hand, and yourselves on the other, with regard to the part which should be played by government agencies in the attack on the accident problem, in that, in our case these agencies often participate in voluntary effort. This integration of effort in the voluntary field is as true of Denmark and Sweden as it is of Britain. We are all agreed, however, that if we are to achieve a major breakthrough and reduce the toll of accidents, much more is needed, and this can only

come from forward-thinking and voluntary action. The whole basis of the thinking behind the present Conference is the stimulation through leadership of voluntary action, and demonstrates that the Administration has its part to play, as we in Europe firmly believe.

Voluntary Action

The Government then has its uses, even if legislation has its limitations. If we are to go forward in our attack in the problems of accident prevention, we must rely on the personal qualities of everyone, and these in turn are stimulated by sound leadership in the voluntary effort to which I have already referred. This necessitates, in addition to all the qualities of leadership I have already mentioned, a clearer understanding than we have at present of the basic nature of the problems confronting us. Rapid technological change, which provides us with unparalleled opportunities for making the industrial environment both safer and healthful to work in, should also enable us to carry out research as to the reasons why people behave as they do. For example, we have known for 2,000 years that, as Ovid said, "Pleasure derived from what is safe is less valued." Why is this? This recognises a human trait that is so difficult to deal with that the inspirations of others by leadership is imperative. We have got to develop a feeling of personal involvement, and also self-reliance, in every individual, while still remembering that "No man is an island sacred unto himself." This entails a study of psychology, including the effect of group behaviour on individuals—a subject to which I shall return later.

Before I do this, however, I wish to say something about certain bodies and organisations which, in the United Kingdom, are exercising leadership through the development of forward-thinking and voluntary action by a wide variety of methods. For example, the Safety, Health and Welfare Committee of the British Employers' Confederation, that covers all branches of industry. It is apparent from the interchange of ideas in this Committee that, because of the different nature of their problems, different industries adopt different approaches. Some of the industries that have very lively industrial safety organisations are those concerned with aluminium, cement, chemicals, glass, and petroleum. I mentioned these in alphabetical order so that there should be no thought that one is necessarily better than the other. There are many others that could be added to the list, such as the rubber industry, where they have had a National Joint Advisory Committee for many years, an arrangement incidentally, that has only just come to pass in the Iron and Steel Industry.

The Central Accident Prevention Committee of the Iron and Steel Industry in Britain is an example of an industrial organisation concerned with the safety, health, and welfare of all those who serve the industry. It was formed some 10 years ago as a policymaking committee only, and consists of managing directors and general managers; in other words, senior men who can take policy decisions. When it gets down to actual field work, a member of the committee must be the chairman of any working party or subcommittee setup, but the committee has the power to co-opt experts in any particular field.

Another body that must be mentioned is the Royal Society for the Prevention of Accidents, a voluntary organisation, in spite of the fact that it derives considerable support from Government departments such as the Ministry of Transport and the Ministry of Labour. I would like to stress that the voluntary approach is applied through the Society to all forms of accident prevention, be they on the road, in the home, in agriculture, or in industry. The Society was founded 30 years ago as an industrial safety organisation to promote the interchange of ideas and to provide information services, advertising and other propaganda matter. It provides an advisory service, particularly for smaller firms, and organises meetings up and down the country. It will carry out investigations in particular works for a fee. Above all, it provides training courses for supervisors and safety engineers of a general character, and is prepared to put on specialist courses for particular industries such as those currently being run for supervisors in the building industry, the demand for which has increased enormously as a result of the introduction of recent legislation requiring a safety man on every site. Representatives of local authorities as well as the Central Government take an active part in the work of the Society, and by this means there is a considerable coordination of effort as well as interchange of ideas.

The above bodies provide examples of leadership by central organisations and show the contribution these can make by the stimulation of voluntary action in firms and even through individuals.

Undoubtedly, however, it is at the level of the enterprise and through the inspiration and example of individuals within an organisation that the greatest impact of voluntary action can be achieved. During this Conference, we have heard much about this aspect of leadership in the job safety campaign, and I will not presume to go over ground which has already been so admirably covered. I do wish, however, to take two qualities of leadership which I have not previously mentioned and to indicate how these may be vital in bringing us closer to that breakthrough we are all seeking. The qualities are "flexibility" and "receptiveness." These two must go together, and when they are both pres-

ent new ideas will be welcomed, tested, modified, and adapted to the solution of existing problems. This, in turn, by the very success it must engender, will stimulate the search for, and the adaption of, further new ideas and methods to meet the challenge of this age of rapid technological change, and all its consequent repercussions.

As examples of this combination of flexibility and receptiveness, I would like to say something about our approach in Britain where, amongst others, we are developing along two or three different lines which have been, at least in part inspired by work that has been done and is going on over here in the United States. Like you, some of us have been aware of the potentialities for increasing our knowledge of causes of accidents suggested by the Heinrich Formula, and by extending our investigations to all forms of accidents and not only those causing a personal injury. The potential for increasing our data would be a factor of two or three hundred.

It was therefore with very great interest, even excitement, that Barry and I, when we were over here in 1960, learned of the introduction of the system of "Damage Control" by the Lukens Steel Company. We wrote this up in our magazine *Safety* after first consulting with Lukens, and I must say that that particular issue has had a higher circulation in the United States than any other we have produced—in fact, it is now out of print. We were not content to leave it there, and although our progress has been relatively slow, we have kept in touch with the Lukens Company; and one or two of the steel works in Britain have introduced "Damage Control" into certain departments, and one at least has introduced it throughout the works. Difficulties have been encountered and results so far are not as spectacular as those achieved by Lukens, but we have been encouraged to set up, on an industry basis, a working party to investigate all the aspects of the introduction of a damage control scheme, and the British Iron and Steel Federation has appointed a man of very considerable industrial safety experience, both overseas and in Britain, whose prime task will be to encourage the introduction of damage control schemes into various works throughout the country, tailored to suit their own particular conditions. I hope he will be paying a visit over here, particularly to the Lukens Company, in the course of the next few months, and that he will be accompanied by a member of the Industry's research organisation who is a psychologist and who is also interested in ergonomics and other branches of operational research.

Research

The concepts of receptiveness and flexibility must not end with the individual or the local enterprise. The search for new ideas and their

introduction must also be the concern of the central organisations I have mentioned. Indeed, much of the research which is necessary is frequently beyond the capabilities of individual firms, and often of entire industries. The wider horizons of these organisations also mean that they can better appreciate the problems which appear to offer the promise of the greatest reward, if they can be solved. This brings me to the need for a dynamic, realistic but selective approach to research, and opens up many fields from which I can only mention a few projects which we have in train in Britain. I shall deal with two types of research:

a. What I term essentially practical efforts dealing with tangible problems like equipment, protective clothing, or the evaluation of statistics.
b. The more intangible aspects covering human beings and their behaviour, response to environment, and associated fields where the problems concern people and involve many imponderables, including the use of techniques which themselves are frequently experimental and not fully understood.

A piece of detailed practical research, which we have just completed, stemmed directly from our visit in 1960, when we were very struck by the fact that in some steel works the men who required protective clothing as a safeguard against splashes of molten iron, slag or steel, were wearing woolen clothing, whereas in other works they were wearing cotton. In each case it was claimed that the other people were wrong, and that theirs was the only material which stood up to repeated launderings and still retained its anti-burning and protective properties. When we returned home, having already seen samples of yet another material from Italy, we thought it would be worth while to investigate this further, and, in fact, have carried out a very detailed piece of research on 15 different materials to test their resistance to splashes of hot substances. We found in several cases that the claims made for various materials were not justified, and that one or two were positively dangerous after they had been laundered or drycleaned once or twice. The materials were graded in the test according to an arbitrary system, which seemed to us to be relevant to the objects that we had in mind. You may be interested to know that the product best meeting our criteria was British, but the next three were American in origin. The only difficulty is that all four are extremely expensive, particularly the British one, which is a very high grade, indeed, of woolen cloth. The research was as thorough as we could possibly devise it, and included abrasion tests as well as various launderings to which I have referred, the object being to find out whether or not there was a suitable material which would have a working life of about 12 months and still be acceptable to the wearer. I

have learned since I arrived in Washington that you, too, have been researching into this problem, and I hope that we will exchange our findings.

Other items of protective equipment which have been constantly studied are: the provision of satisfactory instep protection for the feet, improvement in the design of helmets so that they will give better protection to blows on the side of the head, and the perennial problem that we all have of finding goggles which will not mist up for use in hot conditions.

We have all tried double lenses, but research recently in Germany has indicated that if an adequate air supply can be introduced between the lenses, a good deal of success can be achieved to prevent misting. This idea we have coupled to a recent British development of a suit providing so-called "dynamic cooling," and this may well prove the answer for men who must work in hot and confined places such as furnace wreckers and many others in steel works and other enterprises.

This dynamically cooled suit is an idea which has been developed by the Environmental Physiology Research Unit of the British Medical Research Council under a bursary scheme with the British Iron and Steel Research Association. The Medical Research Council's Unit was set up initially to study some of the problems of working in coal mines, but it was recognised that similar problems occurred in the iron and steel and other industries, where people were often required to work under much hotter conditions than are found in coal mines. As a result, this piece of sponsored research was established, and has resulted in the production of a suit with a low-pressure air system supplied into it at the back. This air does not escape through vents in the usual way, but through the pores of the material, and so functions more or less as the second skin. The usefulness of this suit has been demonstrated in temperatures of up to 180° C., and whilst there are still one or two minor teething troubles, these suits have been worn by men within furnaces, and a modified version of them is being used regularly by crane drivers in soaking pit buildings, thereby overcoming the problems created by the necessity of air conditioning the crane cabs, with all the attendant problems of communication. This type of research is continuing, and, furthermore, contact is being maintained on an informal basis with the European Coal and Steel Community, many of whose meetings we are invited to attend as observers.

A further piece of work which may be of value to industry generally has not yet been widely applied, but, nevertheless, holds out a prospect of providing a very useful tool for management. It concerns the interpretation and evaluation of injury statistics. The current method of recording injury statistics is unsatisfactory, and quality control

statistical techniques can be applied to them with advantage. Suitably adapted, they can give a manager, or a managing director, an immediate indication as to whether the lost-time injuries resulting from his operations are improving or deteriorating, but more important, whether the fluctuations are due to chance or to some cogent factor. The use of this technique means there can be readily available for everybody with any authority, a yardstick which enables them to compare their current performances with their previous efforts. If things are getting worse, then the cause must be investigated; if they are staying normal, perhaps there is no need for immediate action, but an improvement also calls for an investigation into its cause to see if this cause could with advantage be more widely applied.

The advent of "damage control" and the greatly increased flow of data that it should produce, will make this method of statistical evaluation even more effective.

I would now like to look at some of the human problems which have been claiming our attention, and I will start again with protective clothing. Designing such clothing is a practical issue; getting men to wear it is a human one, and a field in which I think you have had greater success than we have. I have often said that had baseball been the national game of Britain instead of cricket, we should have had a lot less trouble in persuading people in the works to wear suitable protective clothing. There is undoubtedly an antipathy in Britain to the wearing of such clothing, which is held, particularly by some of the older generation, to be effeminate or "sissy," in the British phrase. This attitude of mind unfortunately sometimes gets passed on to the young intake, and so, in some degree, is self-perpetuating. The fact is, of course, that some of the protective clothing is uncomfortable compared with ordinary working clothes, and unless the individuals who are required to wear them are convinced of the necessity for wearing them, they do not approach them in the right frame of mind. You, in my view, have adopted the right course of action by building up in people's minds through propaganda, patient advice, and exhortation pictures of workmen suitably clothed and equipped to carry out their daily tasks in various industrial enterprises.

I mentioned earlier the importance of selecting projects for research where the payoff was likely to be high. With this in mind we, in the United Kingdom, are investigating the problems of accident prevention in small works, where, in fact, more people earn their livelihood and carry out their daily tasks than in the large industrial empires which tend to receive far more publicity. The research is by no means completed, but many of the problems are undoubtedly related to psychological and human factors. The introduction of group schemes

for both accident prevention and industrial health, whereby several small enterprises share the services of a safety engineer or medical officer, show considerable promise, and the increased concern, attention and help being shown by the Government and central organisations, is perhaps stimulating in the smaller concerns a spirit of self-help and feeling of belonging which, with a few notable exceptions, hitherto has not been evident. Here undoubtedly is a very promising field where sound leadership could result in rapid advances.

As a final example of our search for the answers to some of the problems which motivate human beings, we, too, like you, have been studying the influence of group behaviour upon individuals. This is of necessity a long-term piece of research, which was initiated some 10 years ago, and which may well take another two or three years before any really cogent results can be deduced. We do already, however, know a good deal about the unconscious effects of group behaviour on individuals, and how this in turn is related to length of service with an enterprise, and the manner in which the individual eventually conforms to the norm of the group.

As a generalisation, we have found that people with less than 2 years' service are more liable to have an injury-producing accident than those who have been in the same occupation for over 2 years, but we also know that the newcomers usually start with a lower general absence record due to minor ailments and casual absenteeism than those who have been with the unit for 2 years or more. After 2 years the dissimilarities tend to disappear and there is a general conformity to works patterns. This is strenuously denied by individuals when they are questioned, but the facts are there and pose a very nice problem for management to solve. I do not mean that absentee records are bad, but they do vary markedly from one works to another, and the conformity is there in spite of the variation. It will be very valuable to understand more about the processes which bring this about, and how these attitudes of mind develop.

Design

Closely related to research is the question of design. The fundamental importance of considering safe-working and related problems, such as fatigue, response times, and the general working environment, including hygiene and health hazards at all stages of plant layout and equipment and process design is, I know, widely appreciated. I am by no means fully convinced, however, that the outcome in terms of practical achievement is as successful and progressive as it might be. Again, there are two approaches. Through legislation, minimum standards for guarding machinery, for environmental factors

and other matters may be established, but in the field of design in its widest sense, voluntary action and goodwill are again far more important in advancing safety standards. The principles that the best design is the safe design and the best method of working is the safe method of working must be accepted. These principles often appear to clash with the pressure for maximum production, but it is my firm belief that as our knowledge of man-machine systems grows, and if the best use is made of ergonomics and other techniques such as method study, this need not be so.

The Ergonomic Section of the British Iron and Steel Research Association was set up in 1947, largely with Mutual Aid Funds provided by this country, to advise firms within the industry on all aspects of design problems and working conditions. It has carried out some excellent work, including the design of crane and loco cabs, open-hearth furnace chargers, the layout of electrical motor controllers, the positioning of control points on rolling mills and studies on display and response times. Much of the work of the section has been of use to industry generally, and made available through the Advisory Service run by the Operational Research Section of the Research Association.

In an address of this kind it is not possible to develop the details of all the various approaches, but I hope that I have said enough to indicate to you that we are trying to apply many of the methods of modern scientific thought and research to the isolation and solution of our problems, and for the stimulation of interest and cooperation at all levels. Where applicable and justified, modern computational techniques are being used in order to analyse, evaluate, and utilise data that we are obtaining.

Communications

One other subject I must mention before I conclude, and that is the subject of communication—a human problem and essential to leadership. I shall use as an example our magazine *Safety* to illustrate some of our approaches to the problem, the magazine which was primarily responsible for the visit Barry and I paid here in 1960, and the contents of which I think some of you at least are aware. This magazine now has a circulation approaching 30,000 copies every quarter, of which well over half are sent directly to individuals, personally addressed to their homes, the names and addresses being supplied either by the works management, or through them by the works safety committees. The object, of course, is communication. By sending the magazine into the men's homes their families see it, and a family page is, in fact, a regular feature. Furthermore they

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feel that it is directed to them as individuals, and not something just put out by the management for general consumption. While primarily directed to the foremen and men, the magazine, nevertheless, from time to time, contains much of interest to senior management, including research articles where they are appropriate, and also articles on what is happening overseas.

We consider communication with the individual to be vital. You, in fact, recognise it in your works organisation, and act on your beliefs much more thoroughly than we do. Speaking from personal experience and from discussions I have had with other people who have visited works in this country, one is always impressed with the amount of time and trouble that is taken by foremen in speaking individually to Tom, Dick, and Harry about some aspect of safe-working, and the trouble these same foremen and supervisors take in recording their interviews. This is by no means the rule in the United Kingdom, but at one or two works where I know they do it, they claim that it is worthwhile and paying a dividend. Many of our works go to a great deal of trouble to hold special safety induction courses for new entrants, particularly young people, although attendance by mature individuals is usually compulsory also. These are normally arranged on a weekly basis so that anyone starting in a works will be able to attend one of these courses within a few days of commencing his works career.

I have touched on a few examples of the way we approach problems, and many of them have been discussed at some length at this Conference. The pooling of all ideas and experiences I am sure is intensely valuable, and we at the moment feel flattered that we have recently been approached for permission to reproduce our magazine *Safety* in three different languages, because it is felt that the approach we have adopted has achieved something in the nature of a breakthrough to the individual that is of vital importance.

CONCLUSION

In summing up, I would like to compare the whole approach to job safety with the ideals behind a famous organisation of which the United States was the inspiration and virtual founder, and in which we once again find ourselves partners. It is the North Atlantic Treaty Organisation. You all know that the concepts behind this alliance were to create the *Will* to act together, to establish the *Shield* of sound defence and goodwill, while retaining the *Sword* of offensive action for use should the need arise.

I believe that in job safety or accident prevention—call it what you like—we all have the *Will* and determination, and that this is abun-

dantly demonstrated by the scale of attendance at this Conference. The *Shield* is represented by those laws and regulations, be they State, Federal, national or international, which have been found necessary to establish minimum standards according to the circumstances that apply, and which, when democratically conceived, realistically enacted and understandingly enforced, can engender mutual confidence and goodwill, and provide a base from which to wield the offensive *Sword* of voluntary action.

The *Sword* of voluntary action has three parts. The hilt that provides the grip and imparts the power to its two cutting edges. This power imparted through the hilt may be likened to leadership, without which the two cutting edges are of no use. These edges are inspiration and example. If their power is imparted by leadership then their control and direction comes from communication and consultation. Finally, one other part of the *Sword* is vital—the sharp point which is the recognition and acceptance by every individual of his or her responsibility both to themselves and others for safe-working.

I feel sure we shall leave this Conference with a renewed *Will* and determination to strengthen the *Shield* of goodwill and mutual understanding, and through inspired leadership and example wield the *Sword* of voluntary action.

Concluding Address

Honorable W. WILLARD WIRTZ, *Secretary of Labor*

Mr. Larke, you have flattered us by coming here at all. You have complimented us by speaking seriously and thoughtfully and obviously with background of great preparation for this meeting. We are exceedingly grateful to you, and we only hope it will seem to you, as it does to all of us, worth the effort. Thank you very much.

Now, on the concluding part of the program, there are two or three matters of business.

I should like once more to express the appreciation of the President, and those of us who have been working with the Committee, to Hunter P. Wharton and to Leo Teplow, for what they have done as far as the arrangements for this meeting are concerned. And that has been a part of their continuing contribution to this program. There is no adequate way of expressing that, except to say, as you know, Hunter and Leo, how grateful we all are.

I have been asked to call your attention to the Report to the President, which is coming from this Conference. Copies of it have been circulated. Some of you already have them, and others may pick

them up at the back of the hall upon the conclusion of this session. I call your attention to one paragraph of this report:

"The 3-day conference was brought to a close by a moving and inspirational address by the Secretary of Labor, who urged that all of the insights of the technicians," and so forth and so on. [Laughter.]

I have several reactions; one is an appreciation of the confidence in that expression and I have a reaction, too, if that is what the President has been told has been done, I must set out to do it. But you and I made a bargain 2 days ago, and that bargain is more in our minds than anything else at the moment. I pointed out that I would deduct whatever time I took to talk to you on Tuesday from whatever time I talked on Thursday. But, you notice, I left out, very carefully, any reference to how long I expected to talk in the first place. [Laughter.] So you have very little to rely on.

I want to do just a little bit about trying to draw together the threads of this conference.

I have been impressed, as you have, with the coverage of the conference. It has been my opportunity, my privilege, and my pleasure, to go over a good many of the papers that have been delivered at various sessions, including some of those you heard earlier this morning. It is an extraordinary area of coverage. I come away from this meeting and from the discussions which have been part of this meeting with two reactions: First, that occupational safety is a concept which necessarily takes its specific meaning from the obligations which each of us faces as an individual. My own concern is about all of the difficulty that comes from going too fast. I think in terms of the James Thurber comment that man is simply moving too fast for a world that is round. And you all know that some day, James Thurber said, there is going to be a great rear-end collision and that man isn't going to know until too late that what hit him from behind is man. [Laughter.]

And as far as the requirements of occupational safety are concerned, I find the answer, too, in a piece of advice which I think has not been brought to the attention of this conference, although at the end of 2½ days, it must be due to the infinite permutations and combinations of the English language that there is anything new to be called to the attention of this body.

But you know "Satchel" Paige's suggestion, who made a comment about the difficulties which are present to most of us. He had a six-point program:

1. Avoid fried meats, which angry up the blood.
2. If your stomach disputes you, lie down and pacify it with cool thoughts.

3. Keep the juices flowing by jangling around gently as you move.
4. Go lightly on the vices such as carrying on in society. The social ramble isn't restful.
5. Avoid running at all times.
6. Don't look back. Something might be gaining on you.

Well, I find a particular application of the doctrines of occupational safety to my own situation in comments and advice such as that.

But all of this is only preliminary to pointing out what is obvious in an appraisal of the discussion of this conference, and that is the discussion has moved from any consideration of narrow concepts of occupational safety to a quick appreciation and a broad evaluation and, if you will, realization of the breadth of the problem with which we are here concerned, and I find, in going over these remarks, a continued emphasis on the fact of knowledge. Mr. Larke brought us knowledge in a quotation from Tennyson. I think of one of Jefferson's: "Knowledge is power; knowledge is safety; knowledge is happiness." I have never been quite sure about the last of the three, but surely the first two are true, that knowledge is power and knowledge is safety; that has been a dominant theme of this conference. And as I read the papers that theme has been broadened out: in the Biblical text, get knowledge, but above all, get understanding. And there has been a repeated emphasis throughout the discussion here upon the fact that knowledge is not enough unless it is accompanied by full understanding.

And then I find as a similar part of the developing theme of the conference that the intelligent consideration of occupational safety must be set in a much broader context. We will not forget, Mr. Larke, that your comments to us went from the specifics of double lenses and protective clothing to a concluding note in terms of the shield and the sword which are NATO, and it is clear to all of us, clearer than it was before, that our consideration of occupational safety is only part of our consideration of the whole broader process of development in the world today.

To read these papers is to be particularly interested in how the study and the discussion of this conference has progressed from the specific areas of accident prevention to the broader considerations this morning of the human aspects of the accident barrier. You have moved from a study of how to control the physical elements of our environment on to the thoughts of dangers inherent in emotional stress, the hazards of human communication, and the difficulties of motivation. You have considered the danger of somebody stubbing his toe; you have also considered the danger of somebody stubbing his tongue. You have recognized that a man can slip a disc because first something

slipped his mind. And you have pointed out that you can lose a limb because you first lose your temper.

Inevitably, the specific concern of this conference has been how to protect man from an increasingly perilous environment, but that has forced you on to a consideration of broad issues. And that is what happens to all of us in the pursuit of any concern of government, which I define only as the concern for interests other than our own. We learn eventually, in all aspects of government endeavor, in common pursuit, that our problem of the moment is often only an example of the greater challenge that mankind faces in learning to control what he knows, and what is created by his knowledge. And I think again of H. G. Wells' reminder, which was after the First World War, I think, that human history becomes more and more a race between education and catastrophe. And now, at a time of a peak of technological development, the power of man's mechanical creations has multiplied the chances that they can get out of control and crush his body; so too, has his technological might developed an increased potentiality to shatter his social interest, and that has been recognized here.

We, in the Department of Labor, face more than anything else the broad vocational aspect of the problem that confronts this conference. Some of the questions that are in our minds are in yours:

How can our society use its vast knowledge to benefit humanity as a whole without crushing those who do not share in this knowledge?

What safety measures—for that is what they are—can we adopt to prevent workers from being vocationally disabled by machines?

How do you restore a man's spirit after it has been crippled by unemployment?

How do you rehabilitate families that are mangled by poverty?

And these are all problems of occupational safety, broadly conceived. We are just beginning to realize that there is much more to it than just the quantitative impact of technology on jobs. We find that nobody knows today what automation is doing to the whole concept and the idea of work. And as we consult more and more the problem which is reflected in boys standing on street corners, we realize that our slums are collecting a grim slag heap of youngsters who find nothing rewarding about any of the employment that they are qualified to do.

We continue under the assumption that the sum total of the work required to produce the goods and services consumed by the population will *necessarily* provide employment for all the working-age members of the population at a time when both productivity and population are in constant flux—and yet that is only an assumption.

We know very little about man's capacity for constructive leisure, just at a point where we know that the distribution of man's time between work and leisure is in the process of change.

And so I suggest to you that I suspect that the most serious portent of the future, today, is not that robots will take over man's work, for I don't think they will, nor that an exploding population will prove for so many centuries that Malthus was right, because I don't think that will work out, nor that the genes of a future generation will be infected with strontium–90. I think the grimmest portent today is rather the warning that the geometrical accumulation of scientific knowledge the world is now experiencing, in effect, dooms the great majority of us to live the rest of our lives in ignorance of most of the forces which will control our lives.

You know, there was a very great safety factor in man's being subject to what used to be accepted as the laws of nature, laws which most of us could, by reasonable learning, understand. Today, the world's scientists have pressed us on to a point where these laws are their playthings, and where we—living now—as I suggested Tuesday—forevermore, a single spark away from ultimate destruction and charged with the control of these forces, cannot understand them or even communicate meaningfully with those who do.

These are the reasons that a conference of this kind comes back, repeated in the suggestions of every speaker, to the emphasis on the basic need for knowledge, for understanding, and control, broadly conceived. I speak in no concern or alarm about the future, but with a great belief in the future, and that it is going to be a good idea, and I do it because it seems to me that the central characteristic of contemporary thought is that our measures of accomplishment, of achievement, are moving away from what is materialistic to what is human.

I have trouble with Dr. Hayakawa's answer this morning to the question of what motivates a businessman to improve safety conditions in the plant. And to whatever extent there was a suggestion earlier this morning that people are getting numb to the sound of the siren, I don't believe that is true. It seems to me more and more there is a human awareness when the bell tolls or the siren sounds, even as it did in the middle of the session this morning, it sounds for us. There is an increasing appreciation, at least as far as the individual ethic in the world is concerned, of the human element in everything that happens. We are a nation and we are a world which will watch on television a new manned missile rise from Cape Canaveral, now Cape Kennedy, with a single thought in our mind, and it has nothing to do with the billions and billions of dollars which have gone into the construction of the missile or the loss or the waste that might occur

as a result of the destruction of that missile; our thoughts are centered solely upon one man who is riding in that machine. Today, a nation gripped with the sense of potential accomplishment with respect to the matter of civil rights, has on its mind only the question of where three boys, 20 and 21 years old, are. There is no matter that we conceive of in terms basically other than those which are individualistic. That is our human individual instinct, and I think it is becoming increasingly the collective societal instinct too; and it is in the realization of this that there lies the hope that will supply the answers to the question of how we can maintain social values that are tough enough, right enough, firm enough, to keep up with technological advance.

I think more and more we are committed as a nation to society as a family of man, to the proposition that there can be no human hostages to progress.

We used to think of progress in materialistic terms. You did, in your industrial revolution, Mr. Larke, and we did in ours. We didn't count the human cost. We do, now, in the period of the technological revolution; we insist upon a careful appraisal, and we measure our achievement and our progress not in terms of what it does, on the average, or to those who are at the median, but what it does in terms of how few are left out.

And so, in closing, let me simply say this. If you who are here would have been asked in advance: "Will you come to a conference at your own expense, and great trouble, great distance, for 3 days, come to the President's Conference on Occupational Safety, take 3 days of your time to save one human life?" all 3,000 of you would have replied "yes," and would have come. It isn't a saving of one human life which will result from this conference, it is a saving of dozens and hundreds and probably thousands of human lives and human futures. There will be the unknown living, which is so much better than the unknown dead, as is illustrated across the river.

There will be no thanks to any individuals. We won't know whose life is saved as a result of this conference. We won't know what little item of communication it is that goes out from this conference. We will know that in an equation in which we would all gladly contribute and participate in the extent that we have in this conference, we will know that there results from it an increase in the enjoyment and the meaningfulness of lives, and that it will be our full satisfaction, and that there is no thanks. Thanks doesn't matter, because it is peculiarly characteristic of people who find their meaning in what they can bring into other people's lives that the standards of satisfaction are within themselves.

So I say to you it is a matter of very great appreciation on our part that you are here. It is a matter of gratification on our part, too, that we can contribute to an evolving program of voluntary and legal enforcement of the principles of good sense and safety, and we agree, Mr. Larke, there is more and more for us to do as a government. We agree, too, with your poet Oliver Goldsmith: "How small of all that human hearts endure, that part which kings and laws can cure."

We will work for better and fuller laws, State and Federal, in this Government and this country. We will know, too, that the burden of occupational safety will continue to rest upon the shoulders of those who find their satisfaction some place other than in a mirror, and find a point of life in what we can bring to other people's lives.

We were convened as a conference, and now we are adjourned in the belief that it is only people who matter.

Thank you all very much. [Applause.]

Part IV

Special Sessions and Workshops

Panel of experts discuss safety of health workers.

WORKSHOP: HOW SAFE ARE HEALTH WORKERS?

Moderator: DR. WILLIAM P. SHEPARD, *Consultant, New York, N.Y.*

Health Hazards to Health Workers

GORDON S. SIEGEL, M.D., *Chief, Employee Health Programs Section, Division of Occupational Health, U.S. Department of Health, Education, and Welfare*

Population growth, and an aging population, changes in social values and systems, an "affluent society," and a host of other factors are interacting to make health services a growth industry—a most phenomenal growth industry. Make no mistake, health workers are engaged in *big* business. The category of health service workers now ranks seventh in the list of major occupational groupings.

An analysis of 1960 data reveals that 2.6 million people were engaged directly in health services, representing 4 percent of the total experienced labor force. In the decade 1950–1960, the population of the United States increased 19 percent—all employment increased 14 percent—but the number of workers in health services increased an amazing 60 percent. This growth and its resultant health and safety impact is reflected in the choice of this subject and panel for inclusion in the 1964 President's Conference.

Health services is not only a big business, it is an unusual business. Many of the customary incentives to health and safety control in other common enterprises seemingly have been inoperative in the health services. There has been little incentive to promote occupational health and safety as a means of financial loss control and profit stimulation. We find it difficult to measure units of production or to quantitate efficiency as related to delivery of health services. Health service units vary greatly in size, scope, and in function. There is a tremendous array ranging from the solo practitioners of the healing arts to giant hospital corporations, from the one-man research laboratory to medical research institutes employing literally tens of thousands. Disasters highlighting and pointing to occupational health and safety problems have been relatively rare; those which have

occurred have frequently been ignored. Management has been deficient.

Similarly, health workers themselves are often characterized by the adage "Familiarity breeds contempt." It is ironic that workers whose milieu and purpose is the promotion of health and alleviation of disease often have displayed a callous, sometimes irrational, attitude toward the inherent health hazards in their work. Simplest attempts at injury recognition and institution of control measures have been ignored or resisted.

Now, however, we are faced with a giant, growing enterprise, one in which the sheer economic burden of modern medical care and research dictates attempts to institute efficient management. The fantastic associated technology in which health workers are enmeshed is beginning to take a visible, increasing work-related injury and disease toll. Thus, there is now belated recognition, and some understandable fear, of modern health and safety problems in the health services industry.

Those of us who are more than passingly interested in this problem, and in developing control measures, find few reliable facts and figures to help determine accurately the scope and nature of the problem. Attempts to assess meaningful work-injury and illness facts and figures are frustrating, for strangely, among health workers who pride themselves on the necessity for maintaining accurate and detailed records, little vital occupational health and safety data are recorded. Yet, there is no paucity of incidents to clearly indicate that there are important unsolved health and safety problems. I am sure that my fellow panelists will amply discuss specific problem areas and experiences which will bear out my conclusions.

Specific examples are enlightening and focus attention on the urgency of some current health hazards to health workers. Who are these health workers? Some 1.2 million persons are professional and technical workers, some 0.8 million are service workers, an additional 0.4 million are clerical workers, and 0.2 million other workers are officials, craftsmen, operators, and laborers.

Many of these people are struggling with the health work of mental hygiene and mental illness care. The department of mental hygiene of a large State recently reported on disabling work injuries to its 15,000 employees over a 1-year period. There were 1,649 disabling injuries, including 3 fatalities. There were 44 fractures, 27 burns, and 21 crushing injuries—this in a "service" occupational group! The heaviest U.S. manufacturing industry would never accept 1,649 disabling work injuries a year, resulting in 38,000 man-days lost time, in an employee-force of 15,000 workers.

Health practitioners at all levels are prone to attack by unexpected—and perhaps lethal—hazards. A recent issue of the British Medical Journal editorialized on "lessons about smallpox." I quote, "In the outbreaks here 67 cases occurred with 26 deaths, giving a fatality of 39 percent—some indication of the lethal nature of smallpox . . . turning to the cases themselves, we first see the serious consequences of inadequately protected medical and auxiliary staff who may come into contact with smallpox at any time in the course of their ordinary duties . . . the erratic visitations of smallpox seem to lull us into a false sense of security."

Hospitals have striven mightily to safeguard the welfare and safety of their patients. What of their employees? The Bureau of Labor Statistics of the U.S. Department of Labor undertook an extensive and detailed study of the work-injury experience of hospital employees based upon records for the year 1953. This represented a full year's experience for approximately 838,000 hospital workers. Strains and sprains, hernias, and fractures are usually indicative of heavy manual handling activities. Special studies made by the Bureau in 12 other industries showed only one industry, warehousing and storage, with a greater proportion of strains and sprains than hospital workers.

Laboratory workers and researchers may be in the forefront of danger. At a recent national meeting on occupational zoonoses (diseases of animals transmittable to man), it was reported that there have been 16 deaths among laboratory and research workers due to infection with monkey B virus. This disease of nonhuman primates, which generally produces a mild illness in the natural host, frequently produces a fatal encephalitis in man. Vigorous attempts are being made to develop a vaccine to protect laboratory workers and researchers working with monkey colonies. Recent surveys carried out by the Division of Occupational Health, unfortunately, adequately document the lack of understanding and safety hazards found among laboratory personnel. There has been a concomitant lack of vigorous management effort to promote health and safety. Expert chemists may, and frequently do, have poor understanding of the health and safety factors and problems associated with their work. Rudimentary safety controls, such as the grounding of electrical equipment, the availability and enforcement of the proper use of eye protective equipment, instruction in toxicity and appropriate emergency first aid, are often inadequate or completely lacking. The current technologic revolution has intensified and compounded such problems.

To reiterate: Health work is big business. Large numbers of health workers are engaged in a growth industry. Both "management" and

"labor" in the health services have been guilty of neglect of the problem of occupational health and safety. The growth of health services, and the rapid increase in the number of health workers, coupled with the economic necessity for efficiency of operation in health services are bringing the neglected problems of occupational health and safety to attention. Technological advance, in addition to its benefits, is all too often providing daily deleterious health and safety environments for health workers. The health hazards to health workers, although significant, have been dimly perceived and inadequately studied; indicated programs of occupational health and safety control must be instituted. It is my hope that this workshop and this Conference can focus national attention on the problem.

Accident Hazards of Health Workers

James B. Black, *Safety Officer, Public Health Service, U.S. Department of Health, Education, and Welfare*

A few years ago in an eastern hospital, a physician caused hot metal to spew out into nearby nursing cribs when he attempted to tighten a leaking safety release on an oxygen cylinder with a greasy wrench. Contacting oxygen with grease and attempting to adjust a safety release, or for that matter, any fitting under high pressure might indicate that training in the health industries is almost nonexistent. Training is the key to success but it continues to offer a formidable stumbling block for several reasons: Because supervisory personnel are more highly educated than in most other industries, they feel that any time taken to receive environmental control instructions would be wasteful; most health agencies do not employ safety personnel but of those that do, divided authority among such facets as infection control, waste disposal, radiation monitoring, sanitation, fire prevention, disaster planning, and accident prevention dissipate the quality of instruction; good training is partially based on a knowledgeable instructor, but knowledge is difficult to come by in the health industry because hazardous incident narrations are never readily exchanged between agencies because of possible legal implications, notoriety, and because patients and citizens would soon lose faith in such establishments. Fortunately health workers do read and, through the written medium, accelerating progress is being made. Many useless statistics are gradually being replaced by descriptions of specific incidents narrated in pharmaceutical, biological, and chemical house organs, State and Federal health, industrial hygiene, and hospital newsletters, and in separate publications of the AMA, AHA, and the MCA.

Some training should be aimed at imparting specific knowledge and some at creating a hazard awareness. For example, most health workers would be completely surprised to learn that the autoclaving of cellulose nitrate centrifuge tubes may cause an explosion; that stoppered vials may implode if subjected to fast exhaust; that ampoules of biological materials may explode upon removal from a liquid nitrogen refrigerator; that a person could be asphyxiated if he worked a few seconds too long in a walk-in box where dry ice is stored; and that the storage of flammable solvents in a domestic refrigerator, the distillation of ether, and the disposal of picric acid could result in explosions.

In addition to inadequate training, other management deficiencies exist to further complicate the problem of minimizing disability. For the most part, health employees work as individuals at nonroutine assignments and without physical supervision. For example, a technician narrowly missed complete blindness moments after he had screwed the lid down on a bottle full of leftover chemicals which he had gathered together in an attempt to clean up the laboratory.

Health workers do not work at a constant site where variables are at a minimum, but in places such as homes, in swamps, and at meat-packing houses. A meat inspector told me about a warning sign he had observed in a large storage refrigerator. It read, "Use This Axe in Case of Emergency—It Won't Do You Any Good But It Will Keep You Warm." How many cold boxes like this are equipped with an alarm bell and an internal unbolting system?

Health workers handle people who are at times noncooperative and unpredictable. Many nursing personnel suffer strains and sprains from lifting or adjusting patients who may suddenly shift their weight in an unexpected fashion. For example, a dentist was struck in the mouth by a psychiatric patient because the attendant failed to warn him about the patient's possible behavior.

Health personnel receive supervision from technical people who are not themselves closely allied enough to the establishment to take interest in the total management, such as a visiting physician to one hospital patient. For example, a physician discards a needle into the waste basket, smokes while applying a flammable solvent to his patient, or does similar things which are strictly against the hospital rules but which cannot be readily controlled by the personnel.

Health activities are not subjected enough to inspection by outsiders; partially because health administrators are doing "the best they can" with limited public and private funds. Also, because inspections in depth would certainly reveal deficiencies on the part of the professional personnel but enough public sympathy could be generated to make such inspections meaningless.

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The communication channel between scientific and administrative personnel is not always clear. For example, a baby was burned to death at a non-PHS hospital because the heating pad failed. It was old, full of pin holes and not rated for wet areas. The purchasing people were not told that heating pads would be used on patients, to say nothing of helpless infants; on the other hand, the nursing staff had been rebuked many times for not making equipment last a little longer. A death resulted from a typical impasse where technical and nontechnical personnel do not always respect each other's particular specialty. In other industries where hazardous operations exist, there would never be a question of extra money to purchase the highest quality equipment and a backup thermostat.

Overlaps in various environmental control disciplines tend to create slow progress. Sealing around pipes may be desired to prevent noise transmission, for vector control for fire prevention, nuisance, toxic, or explosive atmosphere transmission, dry sweepings, or contaminated water from floor flushing. Where control personnel are trained to view environmental deficiencies as a total package, more progress can be made. Another example serves to dramatize this dissipation of effort which, by the way, is not at all limited to health industries but is a weakness of all safety programs. Sanitation people want plastic refuse cans because they're easy to clean; administrators want them because they don't make noise; fire people don't want them because they will transfer fire to adjacent containers; accident-prevention personnel want smaller containers with sturdy top rims to prevent causes of hernias and lacerations and to minimize possible foot injury.

More complex instrumentation creates new hazards which are not well known. Examples include the fire and shock hazards of electrophoresis equipment, ozone created by xenon tube photometry equipment, toxic hazards of gas and vapor chromotography, microwave radiation and sonic vibration equipment, and liquid atmosphere applications.

Scientific personnel are quite often given credit for having more knowledge and ability to apply this knowledge than they actually possess. Although professional personnel are generally aware of toxic chemicals such as mercury or nitric acid, they usually do not become alarmed when a thermometer breaks in a hot oven or a technician drops a large bottle of nitric acid on the floor, although either exposure could be lethal.

Now, how to speed up the breakthrough in health industries. First of all, the professional personnel must be convinced that a problem exists. Then the administrator must be educated to coordinate the many disciplines required to produce an effective control of the en-

vironment, looking upon accidents as a single symptom of deficient management. These two steps should produce enough light to uncover a path to progress.

The Private Hospital's Interest in Employee Health and Safety

Pat N. Groner, *Administrator, Baptist Hospital, Pensacola, Fla.*

When an ambulance siren screams and an accident victim starts his ride to a hospital, most people—safety experts included—figure this as the natural direction of events.

I mean it's just that way: accidents occur in the home, on the highway, in the industrial plant, and then the victim is treated in a hospital. Right? Perhaps that's the way people *think* about it. But unfortunately, hospitals sustain on-the-job injuries, too, hence, they're vitally interested in safety programs at *both* ends of the spectrum.

Let's explore this two-way street and see WHY hospitals are interested, what they're doing, and what some wide-awake institutions have developed as a philosophy of safety that may—just may—help spark this new breakthrough in the war on injuries.

First—and this may come as something of a surprise—hospitals, taken as a group, are the Nation's largest employer, exclusive of government agencies. That's right! Today's U.S. hospitals have an employment total of some 1.8 million people, many of them in highly skilled professional jobs. These totals are exclusive of doctors and hospital volunteer workers.

Hence, strictly from the obvious points concerning cost of injuries in dollars, efficiency and morale, hospital leaders are anxious to find new ways to curb accident rates.

Our own hospital is typical. During the past half-dozen years we have focused attention on safety far more than most: with staff leadership, scrupulous attention to hazards inspection, and followup wherever dangers or injuries seemed to occur. These efforts were rewarded by an excellent record for several years. But despite our initial success, we find the frequency curve zigzagging up and down, with new hazards being uncovered and other injuries occurring which indicate that our teaching job is far from complete. We have done the things that are usually said to be fundamental in a well-rounded institutional safety plan; but like many of you, we recognize that we are still far short of perfection. There seems to be at least one missing link in what we're doing.

Second, hospitals are becoming cost-price conscious, for they are a target of criticism from a number of quarters—criticism which deals with the amounts being spent for hospital care.

This is not a message on hospital economics; but measuring one side of our rising interest in national safety, you should recognize this fact: today about 7 percent of all patient hospital charges stem from injury cases. Now, if you and I and every other business leader could kindle a spirit of safety consciousness which would eliminate the bulk of unnecessary injuries, the overall annual price tag for medical care in America would drop enough to equate today's family expenditures with those of 30 years ago—on a percentage basis. *Let me repeat: if unwarranted injuries were curbed, the American public would be paying almost exactly the same percentage of total income for medical care as they did in 1933!* So you see, economically, hospitals, insurance companies, safety engineers, and the man on the street *should* be interested in this business of safety.

I do not have complete 1963 statistics, but 1962 will serve my purposes for the next point. If we put up a chart and traced the trends in on-the-job injuries, employee fatalities, frequency rates, and numbers of persons employed from the turn of this century forward, we could not help but be impressed. True, 1962 edged back up a bit, but by and large business leaders can take pride in the fact that results are all for the better. They tell me that in 1912, nearly 21,000 people lost their lives in an industrial economy with a billion-dollar national product. Then, there were fewer than 40 million people in the labor market. In 1962, with 65 million at work there were fewer than 14,000 deaths. That's progress! The decades of the forties and fifties alone were outstanding in their contribution to safety and accident prevention.

I think management has done a basically good job of safeguarding machinery and equipment, spotting major hazards and seeking an atmosphere of safe operations. This goes for hospitals, too. Oh, yes, we have our hazards! We have more potentially slippery floors than a skating rink, more potential needle puncture wounds than a knitting mill, more blind stairway corners than a skyscraper, more exposure to explosive gases than many an oil refinery, and we have our share of injuries. But, like your business, we've made strides up to a point. And, like you, we're looking for the new breakthrough. Here's one idea:

In the early years of this century, there were no safety laws, no workmen's compensation codes, and few large employers who did not hide behind the doctrine of contributory negligence to avoid payment of accident costs. This was part of the industrial revolution we'd like

to forget—but it was there—and it caused a moral uprising by people on the job. Political leaders, like the LaFollettes, championed the cause; and soon the crusade was on! Men on the job fired that crusade! They saw their friends and coworkers maimed; and they did something about it! Because they were interested, they worked with—no, they prodded—management for improvements.

Those improvements came, of course. I think one of the big reasons why we can point to such unusual success in safety in the early 1940's was the team spirit of people at work wanting to do their best for the war effort. A man off the job for injury reasons was hurting the team; hence working people revived that personal interest in the day-to-day mechanics of accident prevention. That spirit held over into the next decade. *But—unless I miss my guess—the impact of that psychology has gone glimmering, and today most of the responsibility—and interest—rests with management. Thus in 60 years the pendulum has swung 180 degrees*—from a day in which the safety spark was generated by the man on the job to a time when management has picked up the load.

Let me illustrate. A few weeks ago, a salesman for an auto supply firm was brought to our emergency room suffering from severe facial lacerations. He had been thrown against his windshield in an auto accident. Quizzed about the incident, he said something like this: "Sure, I had seatbelts. In fact, our company sells 'em. But I didn't have them fastened. I seldom do. I just haven't gotten into the habit, I guess." To me, this is typical of what is happening in safety in so many cases. The hazard is known, the protection is provided, yet the people who are exposed are not educated and moved to use it!

This poses a challenge in motivation! In our hospital we found long ago that the road to success is paved with employee enthusiasm and understanding. We spend considerable time and money on communications, training, and developing understanding among our people. We stress personal productivity and we constantly remind our staff that their individual welfare is directly related to the total success of the institution. We use varied methods to bring recognition to people for their achievements. We try to make every employee see and understand that he or she is a key part of a team, and that total success is the sum of all the parts. This is nothing new. You've done the same thing, I'm sure. For any wide-awake management recognizes that its most important asset lies in its trained, motivated, loyal people.

Today we're looking for ways to give new leadership to accident prevention. It is my belief that we should look first at the history of the safety movement, and couple this with what we *know* about per-

sonal motivation. My thesis is that in this decade—in fact, for over 10 years—we have based the country's safety program on technological improvements and have ignored the employee's participation.

Oh, I know we hold safety meetings, and some organizations have safety committees, make inspections, post posters, and write long reports. But ask yourself this: Are we *really* challenging our people? Are we putting forth the communications effort on this program that we put into—say—a cost reduction effort or a mechanical innovation?

Too often safety is delegated and then forgotten. Too often we fall into the trap of developing a paper organization and then—since the safety signs are in place and the new posters up each month—we say, "All's well," and forget it!

How can this be changed? How can we get people to buckle their seatbelts and put the machine of words in place? Here are a few ideas we're working with today that may be helpful. They're not expensive, nor are they time-consuming. We think they offer a practical "breakthrough" value.

First is employee orientation. Most organizations enroll from 12–20 percent of their employment totals each year. A quick study in our area disclosed that only one employer in five was doing more than glossing over safety in the induction program. Thus a large segment of the work force is turned loose each year with little or no safety orientation. We're doing something about *that!*

Second, there is a growing tendency for inspection and follow-through on safety problems to lie solely in management hands. Once, not many years ago, employees were chosen—or chose their own representatives—to participate, to act as a liaison with management. This worked! We're going to take a page out of an old book and revitalize *that!*

Third, we're going to recognize safety performances by departments and individuals in the same way we commend cost control and efficiency. That means we're going to give credit in our house organ, photographic credit, awards credit and every other type of reasonable "pat on the back" that we can find to honor those who discover and solve hazards, and who operate without injury.

Without unduly exploring specific methods, permit me to suggest a few:

The old adage of the value of pictures in "selling" or explaining anything is—I believe—especially true in safety. Therefore, we are using photographic techniques everywhere we can. Safety films are nothing new. But safety films *based upon* individual or *specific indus-*

try needs are! We found, for example, that we can combine a 35 mm. camera, a modest amount of artwork, and some local scripts to tell *our* hospital's safety story for orientation purposes. And we're in the process now of creating a series of short, specialized films to use in supervisor-employee meetings for emphasis on fire protection, specific types of injuries, and so-called "trouble spots." For slightly more than $100, any organization can do the same! When employees see *their* jobsites, *their* friends, and *their* problems, they pay attention, and they respond.

We're setting up similar procedures for our bulletin boards and our house organ, too, using photographs taken in our hospital to spell out hazards, to recognize people who are working in the safety program and who have enjoyed significant records. In short, we are aiming at safety the same as we aim at cost control and personal productivity, by "selling" our people, by giving them responsibility and duly recognizing their specific roles. The technique works for other problems—it has worked in America in the past but recently has been largely bypassed in favor of "canned approaches." We propose to revive it, coupled with the advantages of personalized audio-visuals. Should any of you here today be interested in further details of these methods and examples, we'd be delighted to cooperate.

"Everyone's" business is no one's business. By pinpointing responsibility at the level where it will do the most good, I believe we can achieve this new breakthrough. And I believe we must subscribe to the old training director's maxim which goes something like this: "First, we've got to tell them what we're going to tell them. Then we've got to tell them. And finally, we've got to tell them what we've told them." In safety, this makes sense. By using the internal communications techniques at our fingertips, management can do this and, at the same time, use the interest and energies of the people who may be the most affected.

In conclusion, may I recall a conversation with a leading townsman several years ago who had been reviewing some of our employee relations programs. "These are all well and good," he said, "but what do they cost?" My answer to him is the same as my reply to the need for a more active effort in safety. It doesn't cost—it PAYS! Today, with the changes in sophistication of working people and their attitudes toward work, we cannot afford to ignore such programs as this. They are entitled to have an active role and they must be well informed and recognized if their participation is to be meaningful.

We believe such programs as this will start the ball rolling.

The Nurse's Role in Clinic and Hospital Safety

LEOLA P. BURNHAM, R.N., *Section of Occupational Health, Mayo Clinic and Mayo Foundation*

To be good health risks in a clinic or hospital environment, workers should be in reasonably good physical health and properly placed where their job capabilities have been considered. People in excellent health usually do a superior job, and their robust appearance lends a certain assurance to their patients and coworkers.

Nurses can assist medical consultants with physical examinations of individuals whose employment has not yet begun. At the Mayo Clinic, these pre-employment examinations include urinalysis, determination of hemoglobin concentration, leukocyte count, serologic test for syphilis, X-ray of chest, and tuberculin skin test. For those individuals whose prospective work may make special evaluation of the back necessary, X-rays of the lumbar spine are also made. The Minnesota Multiphasic Personality Inventory is included with the routine tests, though it is not used as a placement or employment device but for research purposes only. Simple tests of vision and hearing are conducted by nurses. After the examination and tests have been satisfactorily concluded, the physician prepares his report. The findings are kept on file in the Health Service, where they serve to initiate the health record to be kept on the new employee during his employment with the organization. A report of the preplacement examination goes to the personnel office where a work file is set up.

From this point on—through probationary to regular employment status and finally, with many employees, to the retirement stage—the health record is kept in the Health Service primarily by nurses, aided by members of the medical records team.

Close contact with the various supervisors who report illnesses, ranging from slight acute problems such as colds, viral infections, and aching joints to injuries and serious ailments, gives the nurses in the Health Service an unusual opportunity to serve the employee-patient and the hospital or clinic as well.

For compliance with workmen's compensation laws and for other legal reasons, it is highly desirable that all on-the-job injuries be reported promptly to the industrial nurse. She then completes a "report-of-injury" form which is forwarded to the personnel and insurance departments. Two of the nurse's functions are to acquaint supervisors with this important procedure and to carry on a continuing program of education among supervisors and workers with respect to the prompt reporting of accidents.

Nurses adept in contacts with their patients can often accomplish much in improving attendance by keeping in close telephone or personal contact with employees absent for reasons of illness. A study done at the Mayo Clinic has proved this service to be well worth the time it takes. We make daily contact with every employee absent for reasons of illness, unless the patient is out on convalescent leave and is doing well. Patients on convalescent leave report weekly at their own convenience.

A friendly, warm, and competent nurse can evaluate employees' complaints quickly, deciding whether the physician's advice is needed. She often can help decide whether the patient has an emotional problem which needs attention by the Health Service physician. She may help arrange for an unhappily placed person to have an interview with the personnel officer, which may result in a mutually satisfactory transfer. By virtue of her experience and training, she can often help an individual plan and organize her work on the job and at home so that fatigue will not overwhelm her, causing a health problem. The nurse, not only in the Health Service, but wherever she goes on her rounds, must be aware of her opportunities to observe, teach, and recommend wherever possible.

The safety committee of one of our hospitals conducts a safety program using posters, visual aids, and demonstrations on subjects such as how to lift and transport helpless patients, how to take advantage of the immunization program, how properly to dispose of soiled instruments, and so forth.

In our institution, we make use of pamphlets and posters on safety subjects, which are distributed at little or no cost to the clinic by various agencies, including especially the National Safety Council, of which many industries and corporations are members. Materials having special seasonal significance are available and, in our experience, can be quite effective in safety education when displayed at suitable times of the year on bulletin boards and in pamphlet racks.

In our clinic, a service is provided for special periodic survey testing of employees in hazardous areas—for instance, those working with radioactive materials, those operating certain machines, and those doing bacteriologic work.

The personnel in radioactive areas wear film badges replaced at either 2- or 4-week intervals, depending on the hazard. Persons in this group frequently have RBC, WBC, differential, and platelet blood counts. Also, a certain number have X-ray examinations of the hands yearly, or more frequently if recommended by the responsible physician.

Personnel in the tuberculosis-contact group are given tuberculin skin tests every 4 months. If responses to those tests become positive,

chest X-rays are made every 4 months for 1 year after the conversion. The tests of members of this group are constantly reviewed by a member of the responsible committee of physicians.

One of the less common hazards is that of animal bites in the research-animal area. It speaks well of the supervision to say that this type of injury seldom occurs.

Surgical teams working in the hospital and animal operating areas are required to wear static-free uniforms, including shoes having special static-free soles.

It is well known that in many industries certain groups of workers are exposed to especially significant health hazards. Where medical departments exist, such workers are often offered periodic examinations to ensure—for the sake of the employee as well as of the employer—that health is conserved and that no developments have come about since the last examination, which might in any way endanger the worker or his coworkers. By occasional inspection of work areas and by familiarizing herself with the nature of various jobs in her firm, the occupational nurse can often be of significant assistance in designating those employees for whom routine annual examinations are of special importance.

In the Mayo institutions, one of the employment benefits which brings satisfaction to employees and great help to the nurses is the easy availability of periodic physical examinations. Such examinations are carried out annually for employees over 30 years of age, and every 2 years for those under 30. Our periodic examination includes an interim medical history, physical examination, review of the immunization status, and performance of the usual basic laboratory studies: urinalysis, blood count, tuberculin test, chest X-ray, and, for female employees, a cervical smear. Other tests are ordered as indicated. We enjoy a very satisfactory acceptance of the periodic examination, and we think that it is a major factor in our program of health conservation.

Disease Hazards in the Medical Research Laboratory

Arnold G. Wedum, M.D., *Director of Industrial Health and Safety, U.S. Army Biological Laboratories, Frederick, Md.*

Disease hazards in the medical research laboratory are principally infectious hazards. These are difficult to combat compared with chemical, radiological, mechanical, electrical, and fire hazards. The reasons are: First, the disease is more difficult to detect and to assign as occupationally acquired; second, even if the disease is determined to be occupational, only in 16 to 35 percent of the cases can any definite

act or accident be cited as the means of infection; third, knowledgeable, differential, evaluated information, rules, regulations, codes, and standards, relative to the research hazards and the preventive measures, often are not available; fourth, a systematic "job analysis" of the project relative to safety often is not a conscious part of the research plan; fifth, medical personnel as a rule tend to be more reluctant than, for instance, engineers or chemists to enter into a professionally planned safety program that involves critical scrutiny of the entire research process; and sixth, there still exists a significant tradition of self-sacrifice, according to which the person in medical research is expected to be willing to contract the disease he is studying, particularly if the disease usually is mild and infection confers an appreciable immunity to reinfection.

As a consequence of the combined effect of these influences there is an absence of reliable statistics on the incidence, or on the total number of cases, of occupationally acquired disease in medical research laboratories. Yet even in the absence of reliable statistics, the existent data make it clear that the matter merits attention. Very important in this connection is the fact that many cases of laboratory-acquired illness remain undiagnosed as such because they are not looked for systematically. Of course, there are reasons for this also: First, except for those relatively few situations in which the laboratory is studying a disease with an unmistakable disease syndrome, there may be 10, 20, or more episodes of nonoccupationally incurred illness indistinguishable clinically from the potential specific occupational illness, and differentiable only by laboratory studies, before one definite case of occupational illness is found. In other words, the cost of identification is high. It must be justifiable if it is to be done routinely as part of a medical program. Second, facilities for diagnosis and treatment may not be readily available. Third, for a variety of psychological reasons, both the employee and his supervisor may be reluctant to investigate the illness as possibly occupationally incurred if it is to be reported as a "disabling injury." Fourth, an employee may not cooperate in the diagnostic program if it involves observation in a hospital, when hospitalization causes loss of sick leave or annual leave or its equivalent, or loss of pay, or financial costs, part or all of which could be avoided if he stayed at home during the illness or managed to continue at work.

Now, letting these diseases remain undiagnosed is not always desirable. There are some diseases in which there is serious danger to the patient or to the health of the community, in which early observational hospitalization is important. In other diseases this is unimportant or will vary with circumstances. But in either instance, I believe that discretionary authority should be given at an appro-

priate supervisory level for selected diseases and/or for designated research laboratories, to permit free hospitalization without loss of sick or annual leave, even if the diagnosis eventually is that of non-occupational illness. Otherwise, in our experience, the employee will tend to avoid hospitalization to his own and our detriment. It also is our experience that employees in a research laboratory do not abuse the privilege of free prophylactic hospitalization for an illness declared by an outpatient physician to be presumptively occupational.

Data on the number of laboratory-acquired infections are being collected by a permanent committee of the American Public Health Association, to which I recommend reports be sent. But it is my impression that these cases often are not reported through any safety channels and thereby are not reflected in the accident statistics of the National Safety Council and the Bureau of Labor Statistics. The tendency is to regard these cases as medical records, not as accident records. One reason, associated with the usual absence of any known causative act or accident, is that the "date of injury" is unknown. Our practice is to report this as the date on which the medical diagnosis is established by the attending physician, which may be after the patient has left the hospital, but the date of hospital admission or initial absence from work could be used. I am unaware of a uniform standard in this matter.

When available statistical data are examined, the disabling injury rate per million man-hours worked, caused by occupational disease, may have wide annual variations even in the same institution. This is caused by changes in the research program, emphasis upon safety, and the effectiveness of prophylactic vaccination. A major obstacle to critical comparison of figures from different laboratories is that there are no uniform standards for collection of data. For instance, (1) Is the sampled population limited to laboratory personnel or are supervisory, maintenance, clerical, and custodial personnel included if they have access to the laboratory, or is the base population even broader in its scope? (2) Are only lost-time illnesses included, or are subclinical and mild cases to be included? The latter are just as important as the hospitalized cases in directing attention to a failure in safe technique. (3) Inasmuch as research personnel are notoriously erratic in their hours of work, how many man-hours are to be used per week or year? (4) Military personnel present a problem because their records are kept as man-days.

Table 1 presents data illustrative of these variations. For instance, in our own laboratories during 1943 through 1945 when the microbiological safety program was in its infancy, the disease rates were very high, up to 143 cases per million man-hours in one large laboratory, and up to 35 for all laboratory personnel. Ten years later, after

an intensive safety effort, these rates had come down from 143 to 6, and from 35 to 9. By 1960 through 1962, further improvements in equipment, and major advances in the development of vaccines, had reduced the rate from nine to two cases per million man-hours. However, in the absence of effective vaccination, even the best possible safety equipment will not prevent human error from causing self-infection.

Fatality rates for laboratory infections, as collected in various summaries, range from 1.6 to 7.5 percent, with an average of about four deaths per 100 cases. These figures include cases from all laboratories, including diagnostic laboratories, that handle material infectious to man. These rates are rather high, considering that they are in a relatively small, highly trained group, and considering that the fatality rate for all disabling injuries in the United States for 1962 was 1 percent, and the fatality rate for motor vehicle accidents in 1962 was 2.7 percent, as reported by the National Safety Council.

In conclusion, to reduce the incapacitation and death from occupationally acquired disease among personnel of medical research laboratories, I recommend action to:

1. Evaluate hazards in medical research and prepare corresponding tested countermeasures.
2. Provide consultation services and dissemination of evaluated information.
3. Prepare standards for reporting of cases.
4. Encourage early diagnosis and treatment of cases by selective authorization of free hospitalization for suspected occupational disease without loss of pay, and without charge to sick leave or vacation time.

TABLE 1. *Disabling Occupational Disease in Medical Research Laboratories*

Laboratory	*Cases per million man-hours*
U.S. Army biological laboratories:	
Process research laboratory only, agent 1, 1943–45	143.00
Process research laboratory only, agent 1, 1953–55	6.40
All laboratory-admitted personnel, 1943–45	35.00
All laboratory-admitted civilians, 1954–58	9.10
The same, including non-lost-time infections	11.87
All laboratory-admitted civilians, 1960–62	2.01
A large European laboratory, 1944–59	50.00
Tuberculosis laboratory technicians, Canada, 1947–64 [1]	19.00
Medical research institutes	4.01
National Institutes of Health, 1954–60 [2]	3.41
Public Health laboratories [1]	0.35

[1] Primarily diagnostic, not research, laboratories.
[2] Includes unconfirmed cases.

Health and Safety in the Pharmaceutical Industry

ALLAN P. SKOOG, M.D., *Director, Industrial Health Program, G. D. Searle & Co.*

The pharmaceutical industry differs from many other industries in that, comparatively, a larger number of workers and a great deal more space are devoted to research. At the home laboratories of the company I work for, over 40 percent of the personnel and over 40 percent of the space are concerned with research. Since the end of World War II, there has been a decided change in the industry in that these research units have produced startling new drugs such as antibiotics, tranquilizers, and many steroids which produce changes in our bodies resembling hormone action.

To produce these potent drugs, our chemists are making chemicals daily that have never been made before. Similarity in chemical structure does not necessarily mean you can expect the same effects, toxic or otherwise. The toxicity cannot be determined until actual animal experimentation has been completed. Hence, all these new chemicals are considered extremely hazardous until proved otherwise. All the skills, knowledge, and abilities of our scientists have to be integrated with those of the medical department and our engineering groups to get the work done safely.

Indoctrination

On the day that a new employee reports for work, his indoctrination into the health and safety program of our company begins. A pre-employment physical examination is performed by the medical department and an appraisal of the employee's physical condition is made. Depending on these findings, his job assignment can be made. For example, persons with dermatitis, severe allergies, or asthma are not assigned to animal experimentation; people with any degree of anemia are not assigned to work with solvents; obese individuals or alcoholics are not allowed to be in areas where carbontetrachloride mixtures are used. Job placement is, therefore, an important part of preventive medicine as applied to industry.

Before leaving the medical department the employee is fitted with safety glasses if they are required in his assigned department. If however the employee wears glasses, he is required to bring a copy of his prescription for glasses to the medical department. The safety glasses are then made up for him according to the prescription, at no cost to the employee.

Upon leaving the medical department, the employee reports to his supervisor for further indoctrination into the safety aspects of his new

work. At this time, step by step, all hazards in his area of work are explained and the techniques required to control them are delved into. Rules and regulations pertaining to safety in the department are explained. This process may take hours and in some cases days.

This indoctrination period, we find, is particularly important since many of our employees have just graduated from college. Most colleges do not teach the safety precautions that are required of our employees. Much training is required to have these highly skilled men understand the "whys and wherefores" of our procedures. We have found by experience that if the employee understands our reasons for working in certain ways, he will more readily accept the procedure.

For the next 3 months or more the new employee is assigned to work with an experienced worker. He is under constant observation, checking his safety performance in regard to his work. During the probationary period, the employee's supervisor has many conferences with the employee. Again, during these conferences, "the safe way" of working is dealt with as his work is scheduled and progress observed.

Newer Developments

Frequently in the course of a year, our chemists must use a technique that is not a standard type reaction used in our laboratories. Often new chemicals, which can be purchased on the open market, are used in these reactions. The chemical research division notifies the medical department of the name of the chemical to be used, and also the name of the manufacturer. A letter is sent to these companies for information on the toxicity and the precautions needed in the safe handling of the chemical. The larger companies such as DuPont, Dow, and Eastman readily supply the information needed. However, many of the smaller companies give very meager data. When the information is received, a program is planned for the handling of the reaction safely, using whatever control procedures are needed such as protective clothing, including safety shoes, scrubbing devices, shielding, and the like.

Once a chemical has been made in the individual research laboratory which shows promise in animal experimentation of being a useful marketable product, another big problem develops. The process must be taken from the "test tube" phase and scaled up for manufacture in the so-called "pilot plant." In this transition we find it absolutely essential that the process be analyzed step by step by our entire staff. All hazards and potential hazards are discussed and the proper methods of control are designed. This procedure is written up and is the so-called "bible" for working the new process. The instructions are followed to the letter.

While the process is in the pilot plant, there is a further scrutiny of the operations for safety hazards that need correcting prior to turning the entire project over to our chemical manufacturing division.

During the war, we often heard the expression that there were two ways to do things—the easy way and the Army way. We, at our company, have a better expression: "There must be a better way of doing it." This refers to all procedures and processes. It may mean the installation of a new type air shower, the redesigning of a valve, or even an entire new ventilation system. We are constantly on the alert for this type of suggestion which often comes to light through our "idea pool." The employees are granted cash awards by the company for their ingenuity.

Periodic Physical Examinations

In most progressive manufacturing industries there has been installed a P.M. (preventive maintenance) program. The equipment and machinery are periodically scheduled for examination. They are cleaned and oiled; worn parts are replaced to insure that this machine will not break down and halt production. Much time loss to the company is prevented in this manner with a great saving of dollars as well.

I would like to make a plea for the other half of the machine—actually the most important part—the man who operates it. We have established a program of periodic physical examinations for our employees. The frequency of the examination is based on the age of the employee; the older the person, the more frequent the examination.

Many conditions are discovered early which are readily amenable to treatment. The employees are sent to their own family physician with a copy of our findings. It is the family doctor who does the treating of his patient. Most of our employees return to the company and serve a long and useful life with us.

During the examination ample time is allowed for just plain talking. Call it personal counseling, or what have you. It is at this time we often find out what makes an employee "tick." For example, a supervisor reports that lately an employee is always in a huff, short tempered, and so irritable that he would like to discharge her. If he knew of the illness of her husband and her two children with all the associated problems, the supervisor would be more sympathetic. A word with the supervisor usually brings about a satisfactory solution to the problem of their working together.

Safety Committees

Each department in our organization has its own safety committee. Each member of these committees is rotated in the assignment. The function of the committee is to inspect the area for hazards, instruct other workers in safety procedures, and especially to investigate all accidents occurring within the department.

It has been our experience that once an employee has served on the safety committee he is much more safety conscious than he was previously. The more employees serve, the more safety conscious they become. Safety is not a one man job—safety is everyone's business.

Accident Reports

An accident report is required on each accident regardless of how minor the injury. The accident reports are not worth the time and effort of the supervisors to write them unless the information contained therein is put to use.

All accident reports are filed with the medical department. Copies are distributed to the members of the safety council and the departmental safety committee in which the accident occurred. Each person receiving the report reviews it, and if there are any pertinent comments they are passed on to the people affected by them.

Once a month a summary of all accidents is published in our company paper, which is distributed to all employees. Specifically explained are how and why the accident occurred and what could have been done to prevent it.

The medical department during the past 10 years has analyzed each accident, both lost time and minor. The facts contained in the reports are cataloged as to age, length of service, part injured, cause of accident, and factors involved in the accident. From the information obtained, we are able to determine particularly where our safety program needs to be stressed.

Conclusions

In conclusion there are two facts that I deem essential in the health and safety program of any industry:

First, an inspection of the facilities should be made as often as possible by the physician, safety engineer, supervisors, and even the executives to know the plant and understand the problems related to its operation.

Second, I feel it is of equal importance that you know your employees and win their confidence so, that, in turn, you can learn a lot about your plant and what's going on.

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The Community's Interest in the Health and Safety of Health Workers

WILLIAM A. SAWYER, M.D., *Medical Consultant, International Association of Machinists*

Health care is not considered nor categorized as an industry. Perhaps this is one of the principal reasons why hospitals have done such a demonstrably poor job in providing occupational health services in contrast to some of the excellent programs which other major industries have developed during the past 50 years.

It is very gratifying, therefore, as well as of primary importance to have health services for health workers given a place of prominence in this Conference. In a sense, health care is an industry, but the profits are in terms of personal well-being rather than financial. Hospitals do indeed have an ultimate product—patient care—just as other industries have their ultimate products. And hospitals do indeed employ numbers of persons comparable to those employed in other major industries. Statistically, it looks something like this: full-time employees in hospitals, 1.7 million; in food and related industries, 1.7 million; in transportation equipment, 1.6 million; in machinery other than electrical, 1.4 million; in electrical equipment and supplies, 1.3 million; in apparel and other finished products, 1.2 million.

In essence then, we have an "industry" which tops other major industries in number of employees, which has a total annual expenditure of more than $8 billion, and which has an ultimate product of the most vital concern to us as individuals and to our Nation's welfare—*patient care*. Hospitals are also responsible for the unique and intricate relationship between their staff and the quality of their ultimate product—*patient care*. This fact should add great weight to the other cogent reasons for a health service of quality.

One of the workers in the field of preventive medicine described the hospital as one of man's most complex institutions, yet in essence "nothing more than a group of persons working day and night to relieve the distress and suffering of their fellow man." Who is this "group of persons," this more than 1,700,000 individuals in the health field? What is being done to assure the maintenance of their health, both for their own sakes as employees and for the effect that they have on the persons whom they serve?

Occupational health workers speak of the three E's of safety—engineering, education, and enforcement. But to what extent has the specialized knowledge of occupational health workers been brought to bear on the field of health itself? Is there sufficient communication in

this vital area, as well as application of the basic principles involved?

In exploring these questions, we must give constant attention to the unique two-way street that always exists in hospitals: (1) the potential occupational hazard of the hospital to the employee; and (2) the potential occupational hazard of the employee to the patient. This two-way street is seen most vividly, perhaps, in the risk of contagious disease to the employee from the patient and to the patient from the employee. Less vivid but also of impelling importance are the more subtle relationships between staff and patients. This two-way street itself is set in a background of environmental health, which has it own unique problems affecting employees and patients alike.

Any employee has broad medical needs. Realizing this, a joint committee of the American Hospital Association and the American Medical Association published in 1958 a statement called "Guiding Principles for an Occupational Health Program in a Hospital Employee Group." This was amplified by an article published later that year in the *J.A.M.A.*, by J. S. Felton, entitled "Hospital Employees—Corridor Consultations or Health Maintenance?"

The criteria outlined in these two publications are basic to the development of a hospital health service. They list four objectives of a health service, which are comparable to those followed in other occupational health programs: (1) to aid in the placement of employees; (2) to maintain and improve employees' health and efficiency; (3) to protect employees and patients against health hazards in the hospital; and (4) to reduce worker absenteeism due to illness or injury. This last objective requires a study of the causes of absenteeism, the provision of medical care for occupational illness or injury, and the provision of emergency care for nonoccupational illness or injury.

These four goals require further exploration and are well discussed in an article in the September 1962 issue of the *Journal of Occupational Medicine*, by Beal and Starkweather, entitled "Employee Health Services for Medical Centers and Hospitals." Copies of this study should be in the hands of all hospital administrators. In discussing the first objective—preplacement examination—the authors point out the need to screen out not only those persons with recognizable physical defects which would make their employment inappropriate, but also those persons with sufficient emotional disturbances to seriously impede the recovery of an ill patient. They point out, too, that hospitals often make the error of hiring marginal workers at lower salaries who might be considered unemployable elsewhere, as well as narcotic addicts who often seek work in hospitals. They pointed out, too, that some persons who know or suspect that they have physical defects often seek employment in hospitals, hoping to secure medical and hospital bene-

fits at little or no cost. A study made of 150 housekeeping employees examined at the Palo Alto-Stanford Hospital Center showed only 16 percent to be without significant defects. Thus the preplacement examination, obviously, is of great significance.

In expanding on the second basic objective listed by the joint committee—the maintenance of employee health and efficiency—Felton lists eight areas of endeavor: periodic and special examinations, health education, counseling for emotional problems and for improved job relationships, and consultation with managerial groups regarding administrative and personnel problems.

The third objective—supervision of work environment—is a complex and a demanding one, requiring full-time attention by the proper staff. In some institutions, this is carried out by a team which includes an epidemiologist, a radiation-control officer, and a safety and sanitation officer. Of even greater overall importance, however, is the need for a physician who actually involves himself with the personnel working within this environment. As one example of an environmental health function, the infection-control program at the Palo Alto-Stanford Hospital Center costs more than $50,000 annually in materials alone, plus indirect costs such as additional nursing time and longer laundry cycles which probably triple this figure. Yet the infected employee remains a hazard and his identification becomes a daily task of the greatest importance. At present, the most urgent problem of staphylococcal disseminators from skin lesions and bowel infections can and should be controlled. Other industrial hazards are present, too, and often go unrecognized and unmet. While the aircraft industry has begun to recognize and regulate the problem of noise control, there is not comparable recognition and action with respect to the operation of hospital laundries at the 100 plus decible level—until this becomes apparent through the investigation of hearing loss picked up in routine periodic physical examinations.

The fourth objective—the reduction of absenteeism—calls for a minimum acceptable program which would include responsibility for occupational disease, first-aid measures for nonoccupational illness and injury, and the functions of a health service physician to include surveillance, screening, referral, and health education.

Why have hospitals failed in this obvious need to provide an effective health service? Has it not been brought to their attention sufficiently? Or, when they have attempted to provide something along this line, why has it been so superficial and inadequate? One survey explored 25 hospitals in the San Francisco Bay area and discovered that, while all of them had some type of program called a health service, only 6 of them had any special room or space for this function.

None of them had anything comparable to the program described above. Yet, during the past few decades, many industries in the same area, acquainted with the same principles and objectives, have developed health programs of real significance.

What are the barriers within the health field itself? The study mentioned earlier by Beal and Starkweather pinpoints some of these barriers as follows: employment practices, nonprofit status of hospitals, medical ethics, professional courtesy, medical third parties, emergency-room location, competition for space, role of occupational physicians, and dearth of publications in the general medical literature. Each of these topics is worthy of study in relation to each individual hospital which attempts any health service; without such study and consideration, the best of efforts may fail somewhat in their application.

Let us describe briefly some of these barriers. Is the hospital meeting its responsibility as an employer realistically in terms of the labor market, rather than employing marginal, unproductive workers by offering them lower pay but the psychic reward of community service? Has the hospital come to grips with the problem of its nonprofit status and yet the simultaneous need to spend funds properly on activities not directly related to patient care? Has the hospital administrator, under constant scrutiny to maintain rules of impartiality, avoided the issue of medical ethics and the practice of medicine by setting up a minimal and inadequate health service that would not bring forth any criticism? Has the tradition of professional courtesy, which often degenerates to inadequate corridor consultations, masked the need for a good organized program for employees? Has the question of a "medical third party" confused the issue without a proper study of the facts, which, if understood, would minimize this problem and put it in its proper light?

Is the health service sharing space incompatibly with the emergency room to the disadvantage of both, when a separate location near both the emergency room and the personnel department could have real advantages? In the strongly competitive search for space assignments, is the health service low in priority, or does it have proper status as in many industries which allot at least 1,500 square feet for 1,000 employees? Are occupational- and public-health physicians active on the medical staff of the hospital, and is their special knowledge utilized? Has any effort been made in communication so that helpful, pertinent information will appear in the general medical literature, instead of solely in the occupational health and hospital management literature? It is troublesome to have to state that the medical community as a whole has almost no orientation to the total problem of the employee in the hospital environment.

These barriers can be overcome, but a plan is needed which will be tailored to the individual hospital concerned. The guides and references mentioned should be used in developing this plan. The special knowledge of personnel in occupational health and public health should be used. Better communication should be established between the private physician and the industrial physician. The county health officer should be concerned with the program. Administrators should be aware that fear of working out ethical and political problems can kill a health service before it is born; from an understanding of these problems, however, they can work out proper boundaries of medical ethics. Effective working relationships should be established between the health service director and the hospital epidemiologist, the radiation-control officer, the sanitation and safety officers, and those responsible for postgraduate medical and nursing education. And most important of all is the need to accomplish each physical examination with skill and care, because the professional caliber of this examination is possibly the best measure of the entire program.

It is not intended to imply that nothing of significance in this field has happened in hospitals. Much has happened that is both meritorious and stimulating. But on a nationwide basis it represents only a fragmentary beginning. This fragmentary beginning should be studied vigorously by those who are as yet largely inactive in this effort.

One part of the picture comes to us from Cooperstown, N.Y., where the Hospital Association of New York State holds an annual safety conference each summer. The papers presented at these conferences were of such caliber that they have been published as "The Cooperstown Papers" in the association's official organ, *The Hospital Forum.* They are deserving of serious study. These papers stress the use of incident reports as an integral part of a complete safety program. Without proper incident reporting, a safety program is useless. If this system is vigorously prosecuted, however, it has been demonstrated that accident frequency can be reduced, severity lessened, and environment improved. "The Cooperstown Papers" are full of specific, practical techniques which could be the basis for a most meaningful and successful health program. The fifth annual safety conference will be held in 1964, on August 3–4 at the Otesaga Hotel in Cooperstown.

Another part of this fragmentary picture comes to us from the University of Michigan School of Public Health, in the form of a publication entitled *Hospital Safety and Sanitation with Special Reference to Patient Safety.* This is a compilation of the papers presented at the Institute on Hospital Safety and Sanitation which was conducted there on February 15–16, 1962. The purpose of the institute

was to alert hospitals to the needs in the area of safety and sanitation, the benefits to be derived, the hazards of poor safety practices, and methods whereby each hospital may set up or improve its present safety program. This is perhaps as extensive and provocative a study as can be found and is recommended most highly.

The States of California and New York pioneered in the field of safety in hospitals, with the creation of voluntary associations of hospitals to handle liability and other insurance needs on a group basis. In describing the California program, Ronald Yaw reports:

> "It is interesting to note the far-sighted action of this group in recognizing, right from the start, that the only true road to reduced insurance cost lies in safety and prevention. . . .
>
> "Over the years, this group has evolved a great many practices which have helped all American hospitals. They have been very rigid in their hospital requirements for group participation; and when they find, or have found, an unsafe practice or situation, the hospital is told in very blunt language, 'Shape up or ship out.'
>
> "In addition to doing central reporting and analysis, they have made extensive studies on falls, burns, and medication errors, have taken action as the result of these studies, and then have enforced their action. Within 5 years, their falls out of bed dropped from one for every 261 patient days to one for every 588 patient days. Baby identification errors were reduced to less than 20 percent. Lost needles and sponges were similarly reduced. Some of the devices used were the institution of baby identification systems, the institution of a compulsory hospital formulary, and a rigidly controlled reporting of all incidents whether or not an injury was involved. The result of all this has been a steady downward trend in premium, as the result of a marked decrease in losses."

California hospitals have been very generous in sharing their failures, successes, and experiences with all other hospital groups, so that other States need not explore the same blind road that the California pioneers traveled. New York was next to develop a statewide program, using group buying power and the establishment of effective safety programs. Michigan has also shown great interest in and attention to this field. In reporting on Michigan University Hospital's plan for safety, Minor Vandermade, Jr., Assistant Director, concludes:

> "The author would like to recommend a gimmick to all of those who are interested in rapid promotion of their safety effort. This gimmick, which is reported to be successful in industry, is simply an *interest in safety*, *articulated properly* to assure its recognition as an important value to the administrator, physician, nurse, or other key person. It requires that each person *talk about* safety

with those individuals responsible to him, *ask about action* taken on accidents, and *insist on follow-up.* Articulated interest and direction from the top through the line organization is the greatest possible catalyst for safe action. Each member of a hospital staff, whether a physician, a nurse, an administrator, or a safety officer, will be able to stimulate action in his hospital through proper support of existing programs and the stimulus that his interest and direction can give."

The questions posed here, and the suggestions for overcoming the barriers, represent only a beginning point. Prerequisite to these even is the need for widespread acceptance of the necessity of a complete employee health service in hospitals. When this is realized, the end results will become as tangible and as visible as they have become in private industry, (1) a much improved ultimate product, patient care in this case, and (2) a secure and healthy staff of employees to work for this end.

WORKSHOP: LEADERSHIP IN THE CONTROL OF ENVIRONMENTAL HAZARDS

Moderator: DR. ROBERT T. P. DETREVILLE, *Managing Director, Industrial Hygiene Foundation of America, Inc., Mellon Institute*

What Are the Environmental Problems Today?

THOMAS S. ELY, M.D., *Eastman Kodak Company and University of Rochester, New York*

The Conference is on occupational safety. The workshop is concerned with the environmental aspect of this topic. This paper is about present problems. So, I will be outlining some of the current environmental hazards of workers. "Environment" must be interpreted broadly here, and include not only chemical and radiation aspects, but also such factors as mechanical, thermal, and bacterial.

First, let us consider deaths as a kind of ultimate injury. Of almost 2 million deaths last year (1,800,000), an estimated 101,000, or about 1 in 20, were accidental. Almost half of these accidental deaths were workers. However, of the 45,900 *worker* deaths, less than one-third were *work* deaths—those of direct concern here. This is an estimated 14,200 deaths, and although this represents only one-seventh of all accidental deaths, it is still 14,200 too many.

It is estimated that less than 10 percent of work deaths were due to occupational "disease," and more than 90 percent were due to occupational "injury." These words take on different meanings at different times, but here "injury" means that the death followed the causal accident by a short time, and "disease" means that the death was a relatively long time later. Thus, death due to mechanical violence, drowning, or electrocution is called "injury," and death due to lead poisoning or silicosis is called "disease."

It is interesting to note that a worker is twice as likely to die accidentally off the job as on, and even when figured on the basis of time, if one assumes that not many die accidentally while asleep, the average worker was safer on the job. In the safer occupational groups, such as trade and manufacturing, this difference is striking. When the factory worker comes through the gate in the morning and begins

Panelists answer questions from the audience in workshop discussion of environmental hazards. (l. to r.) Dr. Robert T. deTreville, Industrial Hygiene Foundation of America; Dr. Thomas E. Ely, University of Rochester; Dr. Herbert E. Stokinger, U.S. Public Health Service; Dr. John A. Zapp, Jr., Haskell Laboratory for Toxicology and Industrial Medicine, E. I. du Pont de Nemours & Company.

his work at a large machine he is entering a safer environment than the one he left, from the standpoint of survival. I suspect this is because he left the most dangerous machine parked outside the gate.

The situation is a bit different in the nonfatal but disabling injury statistics. Of the over 10 million such injuries among the population last year, almost half (4,350,000) were workers, and almost half of these (2 million) occurred while he was at work. It is estimated that about 3 percent or 60,000 were due to occupational "disease," and the other 97 percent to occupational "injury," according to our previous definition.

With occupational deaths and injuries thus placed in some perspective, let us look at the kinds of occupations that are involved. *Mining*, *quarrying*, and *construction* had the highest death and injury rates last year, and *trade* and *manufacturing* had the lowest. Differences in death rates with a more than tenfold range from *mining* down to *trade* were more striking than the nonfatal injury rates which had little more than a twofold difference. One way of interpreting this is that a mining injury or a construction injury is more likely to be fatal than a trade injury or a manufacturing injury.

What types of accident are involved in these injuries and deaths? The New York State data show that about one-third of the accidents were of a "struck by" or "struck against" nature. A quarter of them were due to slips and overexertion, and one-fifth were due to falls. In one-ninth, the worker was caught in, by, or between. So far, we have accounted for 90 percent of the accidents, with the force of gravity being the ultimate responsible force for a good share of these. The remaining causes were inhalation, ingestion, and absorption, 3 percent; temperature extremes, 3 percent; continuous activity, 1 percent; and miscellaneous, 3 percent.

Where are these accidents occurring? If we inquire about the size of the organization, we find, for instance, that although half of all workers are found in businesses of 100 employees or fewer, this segment of the working population has more than two-thirds of the injuries. This is to say that injury frequency rates in small businesses are more than double those of large businesses. Why is this? One reason is that the small organization frequently doesn't have a strong health and safety program. It is not large enough, in most cases, to keep a full-time safety expert or medical staff busy, and the result, usually, is that it doesn't have any such people at all. It is a repeated source of surprise to me to find how large a company can get sometimes before it becomes enlightened about health and safety programs.

At this point it is tempting to neglect the toxic occupational problems. Just look at the data presented so far. If all problems of

chemical hazard were completely solved there would be an almost imperceptible drop in the total work deaths and work injuries. So why bother? Well, I think there are at least five reasons:

1. The chemical injuries and deaths that occur are still *that* many *too* many. As long as there is a problem, there should be efforts to control the problem.

2. There is a relatively neglected segment of the working population which is exposed to greater than average toxic risks. In addition to having a poorer traumatic injury record, the small organization is more likely to have trouble with nontraumatic hazards such as chemical toxicity and radiation. In my own recent experience, I have seen cases of lead and mercury disease and overexposure in small plants. The toxicity of these elements has been known for 2,000 years, and few chemicals in use today have been studied as thoroughly. The current situations represent a lack of communication, not of fundamental information. Other old problems that are still popping up today are such things as benzene, carbon tetrachloride, carbon monoxide, arsenic, cyanide, silica, manganese, chromium, cadmium, vanadium, etc.

3. If it were not for the extensive hardware, procedural, and biological controls in operation today, the toxic problems would be many, many times worse. If present efforts were relaxed, the problems would increase.

4. New materials are emerging at a continuing rate. Whether they become safe and useful products or toxicologic nightmares depends on the alertness of those concerned with this sort of safety. Dr. Zapp will have more to say about this later, but I might briefly mention such things as the new "exotic" rocket fuels, the new pesticides, new hydraulic fluids, and components of the new plastics. It has been said that one good synthetic organic chemist can produce 100 new compounds for every one the toxicologist can evaluate, and there are 100 of these chemists for every toxicologist. There are some mitigating factors which make this disparity somewhat less than it may first appear, but the statement serves to draw attention to one problem in this field.

5. It is my job to point out the environmental problems today, not to solve them. However, one of the environmental problems is that we don't know some of the environmental problems. In the field of acute mechanical injury, there is rarely any doubt about the cause and effect relationship. If a man hits his finger with a hammer and the X-ray shows a broken bone, the establishment of cause is not difficult. Even the acute chemical injuries usually don't cause diagnostic trouble. However, when the cause is a protracted low-level exposure

and the effect may be delayed and may be subtle, and particularly when it is a common condition seen in unexposed persons, too, diagnosis becomes difficult. Sometimes it is impossible.

Often the diagnosis cannot be made or even suspected in one individual. Then it is only when groups of workers are studied that the condition becomes evident. For example, almost anyone can get pneumonia, and such a person could be a manganese ore worker. It was not until someone observed that the incidence of pneumonia in a group of manganese ore workers was many times as high as the rest of the population that this disease was recognized as a toxic effect of the material. Similarly, the connection between chromates and lung cancer was not established until the disease rates of chromate workers and an unexposed population were compared. This is called *epidemiology*, and we are going to need it more and more in the future as we look for more and more subtle effects of the working environment. Also, to support this epidemiology, we will need better and better data on the health of the workers over a long period of time. And this is difficult. Large companies and those with relatively stable populations can do this sort of health recording. The small organization and the one with a rapid turnover can't. It may be feasible for insurance carriers to do more of this. It would, of course, always be possible to do it by regulation.

In summary, we have discussed the following points:

1. Most accidental injuries and deaths occur off the job. Many workers are safer at work. Still, there are too many work injuries and deaths, and these are the concern of this Conference.

2. Most work accidents are of a mechanical nature. Injury from such agents as chemicals, radiation, temperature extremes, and electricity forms a relatively smaller segment of the total, but should not be forgotten. New hazards such as microwaves, the optical maser, and the plasma torch need continuing evaluation.

3. The most hazardous occupations are mining, quarrying, construction, and farming.

4. Small organizations are important because most workers are represented there and safety records are poorer there.

5. We should not neglect such nonmechanical areas as chemicals and radiation because new hazards are emerging rapidly in these fields, because the cause and effect relationship is usually more difficult to establish, and because undetected but nevertheless important amounts of disability may occur with these hazards.

6. There is currently a gap between the knowledge of the hazardous nature of a situation and its control in practice. If controls were to be improved *just to the level permitted by our present knowledge*,

there would be a dramatic improvement in occupational injury and death rates. This is a matter of education. It is one of the aims of this Conference.

How Industry Approaches the Problem of Insuring That Its Processes and Products Are Safe

DR. JOHN A. ZAPP, JR.,
Haskell Laboratory for Toxicology and Industrial Medicine,
E. I. duPont de Nemours & Company,
Wilmington, Del.

A discussion of how industry approaches the problem of insuring that its processes and products are safe must necessarily relate to a particular period of time for several reasons. For one thing, social thinking and the law concerning the responsibility of industry, of the individual, and of society as a whole, for the welfare of others has undergone a considerable change. For another, the technical know-how required to make industrial operations safer for the worker, and the products of industry safer for the consumer, has grown steadily.

In this year 1964, it is possible to base our discussion on two goals. These are: (1) that conditions of employment should be such that no worker need inevitably sustain disease or injury as a result of his employment; and (2) that no product which is incapable of being used safely for its intended use should be placed in the hands of the consumer.

Note that these goals do not guarantee safety for either the worker or the consumer. Anyone who works in a plant manufacturing dynamite can blow himself and the plant sky high if he is not careful, and the same is true of the man using the dynamite. But the large scale manufacture and use of dynamite also testify to the possibility of doing both of these things safely.

A hundred, or even fifty, years ago, these goals would have been considered visionary and impractical. And while they are generally accepted today, there still are instances of injuries from processes and products which could be prevented.

As early as 1700 the Italian physician, Barnardino Ramazzini [1] wrote a little book describing varieties of illness which were characteristic of a number of occupations. He states, for example, "Painters are also usually subject to various disorders, such as trembling of the joints, a cachexy, a blackness of the teeth, a discolored complexion,

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[1] Ramazzini, Barnardino *Diseases of Tradesmen,* Medical Lay Press, New York City, 1933 (translation of the 1700 edition).

melancholy, and a loss of smell." Ramazzini considered it important that the physician always inquire about the trade of a patient he was called upon to treat, but the occurrence of these specific diseases of tradesmen seems to have been accepted as a matter of course.

Over a century later, the British pioneer in industrial medicine, Dr. C. T. Thackrah,[2] noted, in 1831, that miners seldom attained the age of 40, that fork grinders who use a dry grindstone die at the age of 28 or 32, and that table knife grinders, on the other hand, who use a wet stone survive to between 40 and 50. He further stated, "Most persons who reflect on the subject, will be inclined to admit that our employments are to a considerable degree injurious to health . . ." and he added, "Evils are suffered to exist, even when the means of correction are known and easily applied. Thoughtlessness or apathy is the only obstacle to success." This attitude, of suffering evils to exist, was characteristic of the time. To quote the Cambridge Modern History: "The Bolton cotton spinner of 1842 had no need to keep his children in health, or his house healthy; his wife could with absolute impunity let the babies die, the whole household was free, in fact to live practically as it chose, even if it infected and demoralized the neighborhood."

Fifty years ago in this country we were moving nearer to today's goals. Dr. W. G. Thompson,[3] in his book *The Occupational Diseases* which appeared in 1914, stated, "It is quite true that many processes of manufacture will always involve risk to health, as many trades necessarily involve risk to limb and life. One cannot handle white lead without risk of disease, just as one cannot use dynamite without risk of injury. Yet, in each case, the workman has the right of warning against the hazard, the right of such protection as modern scientific knowledge affords, and should have the right of compensation when disabled as a result of the lack of such warning and protection." Yet Thompson had to say in the case of "boilermaker's deafness," "Unfortunately, there seems to be no remedy for this hazard . . . and, if a man must work inside a boiler or a gun turret, he has to accept the consequences."

Thinking about a manufacturer's responsibility to the ultimate consumer of his products has also undergone an evolution. The old doctrine of "let the buyer beware" began to be eroded about 100 years ago when the purveyors of defective "inherently dangerous" articles, such as a defective gun or a mislabeled poison, were held liable for the use of "ordinary care." The trend of subsequent court decisions has been to steadily enlarge the responsibility of the manufacturer for in-

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[2] Thackrah, C. T. *The Effects of the Principal Arts, Trades, and Professions, Etc.*, London, 1831.

[3] Thompson, W. G. *The Occupational Diseases*, Appleton & Co., New York City, 1914.

juries caused by his products, and the evolutionary process is still going on. A very readable summary of the current situation is found in an article by L. A. Coleman,[4] which appeared in the November 1963 issue of the *Food Drug Cosmetic Law Journal.*

When I first came with the Du Pont Company in 1945, my laboratory and office overlooked one of the old black powder mills on the banks of the Brandywine, dating from the early 19th century and long abandoned. The building had three very thick walls on the land side and a light wall facing the river. It was symbolic of the hazard of the black powder business. If anything went wrong, the contents and occupants of the building went out over the river. The hazard was minimized by all the techniques known at the time and by strictly limiting the size of the operation and the number of workmen in any one building. The hazard was sudden traumatic injury or death, and this was characteristic of much of industry at that time.

The kind of hazard involved with explosives or with moving machinery is usually quite apparent to the worker. He can literally see the danger. On the other hand, the kinds of hazard described by Ramazzini and his successors, which produce specific occupational diseases, are usually not so obvious and the workmen may be unaware that a hazard even exists. With the rise of the chemical industry, the latter category has become more important.

During the last quarter of the 19th century, the Du Pont Company began to get involved with two new explosives then recently invented by Alfred Nobel—dynamite and guncotton. In dynamite, the active ingredient was nitroglycerine, not only a powerful explosive, but also a powerful drug. In the beginning dynamite workers frequently suffered severe headaches, nausea, and sometimes collapse as a result of excessive exposure to nitroglycerine. With the realization that this new explosive could produce undesirable physiological effects, steps were taken to minimize the exposure.

There wasn't much chemical industry in the United States prior to World War I, and our dependence on the German chemical industry for such things as drugs, dyes, and other chemicals, stimulated efforts on the homefront. Du Pont, for example, decided to attempt the manufacture of aniline dyes. It was successful in the venture and still makes them.

That which is desired in a dye is color, but the color is achieved by reacting various aromatic nitro and amino "intermediate" compounds. These intermediates sometimes produced an unwanted bluish color in the workmen, that was caused by a reaction between the inter-

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[4] Coleman, L. A. "The Deep Pocket Rule and the Jumping Warranty," *Food Drug Cosmetic Law Journal* 18, 654, 1963.

mediates and hemoglobin which prevented the hemoglobin from combining with oxygen. Hence, arterial blood resembled venous blood and imparted a dark bluish color to the complexion. This was a toxic effect which had nothing to do with the final colored product and which had not been anticipated.

The 1920's brought tetraethyl lead, a compound developed solely for the purpose of improving the performance of gasoline engines, but many of the chemists involved with the development apparently underestimated the hazard of working with a fat-soluble lead compound. Some deaths and a substantial number of cases of lead intoxication resulted.

In both of the above instances, toxicity was the unwanted and unanticipated attribute of chemicals developed to meet a particular technological need. Once the toxicity hazard was recognized, appropriate steps were taken to control the hazard. Dynamite, aniline dyes, and tetraethyl lead are still being manufactured, and with very good safety records.

With the rapid growth of the chemical industry following World War I, and particularly with the rise of synthetic chemistry, a great many new materials were made and found to fill some technological need. It seemed only logical that some, at least, of the new compositions of matter would have the unwanted attribute of toxicity. The question was, how these could be recognized before the toxic effects were manifested in terms of human injury and disease.

The Haskell Laboratory for Toxicology and Industrial Medicine was the Du Pont Company's attempt to answer this question. It was opened in January 1935, as a laboratory of industrial toxicology whose function would be to study the toxic effects of new chemicals and processes on laboratory animals so that—from the information gained—the necessary precautions could be taken to manufacture the new chemicals safely. At about the same time, several other chemical companies established similar laboratories, and others have come into existence since then. Commercial laboratories and some universities offer similar services for those who do not have their own toxicological laboratories. Liability insurance companies are always ready to advise their clients on ways to reduce their risk. Many cities and States provide industrial hygiene services and will send experts into plants to survey the hazards and suggest improvements.

Basically, the industrial toxicological laboratory substitutes the exposure of laboratory animals for the exposure of man. It is meaningful to do this because the commonly used laboratory animals, mice, rats, rabbits, guinea pigs, and dogs, are constructed very much as we are. They all have hearts, lungs, liver, kidneys, etc. which perform

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the same functions as they do in man. There are obvious differences, of course, in overall size, shape, habits, diet, and life span, and these must, of course, be taken into account.

Suppose we set out to determine what amount of a chemical it takes just to kill a rat. We would find out first of all that individual rats differ in the amount required, but that the variation is by no means infinite. Rather, it resembles the kind of range in variation that we find in human heights and weights. We have short people and tall people, light people and heavy people, but there is a limit to the variation. We know from experience that men, like rats and other animals, also differ in their susceptibility to the toxic effects of chemicals and drugs. So man resembles the laboratory animals in this important aspect of toxicology. There is no such thing as a single *minimum lethal dose* that would apply to all men or to all rats, but we can determine a kind of average lethal dose for rats or other animals, and we would expect to find a kind of average lethal dose for man if there were any way of determining it experimentally.

Certainly, however, we would expect that it would take a much larger dose to kill a man than it would to kill a relatively tiny rat. The difference in size between the two, or any two, species can be compensated for by expressing the dose as a ratio to the body weight, e.g., milligrams of test substance per kilogram of body weight. On such a basis, the lethal dose for man, the rat, the dog, etc. move much closer together. We still have the problem, however, of possible species difference. Man may be relatively more or less susceptible than, say, the rat. By testing several species of animal, however, and assuming, in the absence of better knowledge, that man is at least as susceptible as the most sensitive species tested, we can at least approximate for working purposes what the average lethal dose for man might be. Such information is valuable for estimating what the chances for injury or death might be if a worker or consumer were to be inadvertently exposed to a given amount of the product.

We can obtain still more information from the kind of tests just described. All of the animals used in the test, whether they die or not, can be utilized. Survivors can be observed to determine whether recovery is rapid and complete or whether permanent damage has occurred. At given times the survivors can be sacrificed. These, along with those that died spontaneously, are examined by pathologists to determine what organs were affected and what kind of damage was produced. This kind of information is essential for the physician if accidental exposure occurs.

The different routes by which chemicals get into the human body can also be duplicated with laboratory animals. These are inhalation

of gases, vapors, mists and dusts; absorption through the skin; and ingestion. Furthermore, local effects on the skin and eyes can be observed.

So far, I have discussed the toxic effects of single exposures to chemicals. This is known as acute toxicity, and its effects are observed within minutes, hours, or a few days after the exposure. There is another kind of toxicity, however, which results from repeated exposures to daily doses, any one of which would produce no signs of toxicity whatever. This occurs when the toxic chemical accumulates in the body over a long period of time. It is called chronic toxicity, and is produced by some chemicals but not by others. The effects of chronic toxicity may not be manifested for months or years.

It is obviously important to determine whether a given chemical is capable of producing chronic toxic effects, and here again the laboratory animals are useful. Graded doses are administered daily to groups of animals for various periods of time and by the various routes of administration. Since rats, for example, live between 2 and 3 years, it is practical to administer the test chemical over their entire life span from childhood to senility and to observe the effects on growth, reproductive performance, behavior, and mortality. Biochemical studies can be carried out during life and pathological examination after death.

Two important laws of toxicity emerge from the animal experiments, both acute and chronic, and we believe that they apply also to man. They are: (1) the toxic effects of a chemical increase with increasing dose; and (2) a small but finite dose can be found which produces no detectable toxic effects whatever.

This second law is extremely important, for it tells us, in effect, that a poison is simply too much of any particular substance. For some materials, "too much" will be a very small absolute amount; for others, it may be a very large amount. It enables us to determine what kind of precautions need to be taken in manufacturing a given compound and also to decide whether it can be used safely for its intended purpose. It is obvious, too, that toxicity studies on animals may guide us to the best and safest choice among competing candidate chemicals for a given use.

Given the necessary knowledge, manufacturers can and do manufacture and use extremely dangerous chemicals without injury to their employees. Consumers generally lack this expert knowledge, and therefore, must not only be given safer products, but must also be instructed in how to use them safely. The mechanism for reaching the consumer is ordinarily through that part of the product label which is commonly referred to as "precautionary information," al-

though in some cases it may be through written instructions for use which accompany the product.

There has been a notable increase in recent years in both the quantity and quality of the precautionary information which reaches the consumer. Much of the type and form of the information on important classes of consumer products, such as pesticides and household products, is now prescribed by various State and Federal laws. Its goal is to call the attention of the consumer to those hazards which may not be immediately obvious—toxicity, flammability, explosibility, corrosiveness, radioactivity, etc.—and to set forth those conditions under which the product can be used safely.

In summary, I think that we can say, in 1964, that industry has found reasonably effective ways of making sure that its processes and products are safe, providing that they are used safely. We no longer have to wait for adverse human experience to disclose the hidden hazards in processes and products because we can anticipate them through laboratory research. The goals which I set forth at the beginning of this talk are attainable, and although we can still say, as Thackrah said in 1931, "Thoughtlessness or apathy is the only obstacle to success," we no longer have to say with him: "Most persons who reflect on the subject will be inclined to admit that our employments are to a considerable degree injurious to health." And we can say with certainty that the products placed in the hands of the consumer today are immeasurably safer than they were even 50 years ago.

As we look to the future, however, we find that we are faced with a new problem which is the direct outgrowth of our rapidly expanding population. This is the contamination of our environment, of air, land, and water. More and more products are being made and used by more and more people. The result is an ever increasing outpouring of waste to reservoirs of air, land, and water which are not increasing concomitantly.

The problem of environmental contamination is not only a problem for industry, but for all segments of the population. However, the chemical industry, among others, recognizes that it has a responsibility in the field of environmental health. Perhaps this is best stated in the recommendations of a planning committee on environmental health which were made last year and approved by the Manufacturing Chemists' Association Board of Directors:

"The Manufacturing Chemists' Association, in view of the mounting environmental health problems of the nation, recognizes its responsibility for assisting in the reduction of these problems, and proposes to develop a more effective and better integrated program of information, education and action in this field.

"The chemical industry has been aware of, concerned about, and has worked to alleviate the problems of environmental health for many years. However, this awareness, concern, and effort has not always reached the entire industry either collectively or individually. Nor has it always gone beyond those problems which involve the industry directly.

"Population is increasing, available land area per person is declining, standards of living are advancing. All of these changes increase the demands man places on his environment and this load will continue to increase at an ever faster rate. Early anticipation of problems and development of means of handling them before they become acute is more and more necessary. Such a comprehensive program requires the participation of each and every person and group in all society, including that segment which comprises the chemical industry."

As a result of the planning committee's recommendations, the Manufacturing Chemists' Association has set up a permanent Advisory Committee on Environmental Health. It is the goal of this committee to stimulate programs which will advance knowledge and increase competence to deal with industry's responsibilities within the total problem of environmental health. It is hoped that from this the chemical industry will be able to improve the appropriateness of its products by the best use of scientific knowledge, and by continuing to improve appropriateness as growing knowledge permits.

What Are Governmental Agencies Doing in Occupational Health?

DR. HERBERT E. STOKINGER, *Division of Occupational Health, Public Health Service, U.S. Department of Health, Education, and Welfare*

This year is a memorable one for the Public Health Service's Division of Occupational Health, because it marks the 50th anniversary of the establishment of the then Division of Industrial Hygiene. Fifty years ago, in 1914, when the division was founded, the first State agency to organize a division of industrial hygiene, New York, was but a year old. Henry Ford introduced the $5 daily wage, the automobile industry scarcely existed, the only synthetic plastic was celluloid, and chemical research and development in industry was enjoyed by only a few farsighted industries. Worker population in 1914 was 25 million, and the division operated without a special budget and with a handful of staff.

Today, the division operates with a staff of 225 and a budget of $5 million. Half of this budget is for extra-mural research. I should like to describe to you what we are doing currently within our direct

budget of $2.8 million, and also outline some of the activities of other governmental agencies in this field.

Activities of the Division of Occupational Health.—The leadership that is supplied by the division will be discussed under four types of activities: First and foremost, the so-called field investigations; second, laboratory research investigations; third, technical assistance; and fourth, training.

Field Investigations.—You have just heard from the previous speaker that the occupational health problems in industry are of two types: (1) determining the safety of chemical products under ordinary conditions of use; and (2) protecting the health and well-being of the workers producing these chemicals. The big unsolved problems facing the Federal agency in occupational health today, however, are of a different nature. They are field investigations, studies of workers in the mines and in the plants, industrywide, across-the-board studies involving many States and counties. They deal chiefly with dust diseases of the lungs and dermatoses, and are of three types: (1) Determining the prevalence of a disease; (2) finding the cause of a disease; and (3) finding the effects of superimposed industrial stresses, such as heat and noise, on workers. The ultimate aim in all cases is the elimination of occupational disease and the control of the hazardous agent in the workplace. Being either epidemiological or clinical-environmental in nature, they are broad, multidisciplinary studies involving teams of physicians, physiologists, engineers, and their technical staffs that perform their examinations of the workers in mobile field units and in the environment in which they work.

The duration of such studies may be many years, depending on the size of the industry being studied and whether study followup is continuous or intermittent. It is common practice in such studies to reopen the study at intervals to determine the effectiveness of the control measures recommended as a result of the initial study. An instance of this procedure was the second reevaluation study made by the Division in 1955 of the Vermont granite industry. The first was made in 1924–26 and was followed by a reexamination in 1937–38. It was extremely comforting to find on the last survey that no single case of silicosis had occurred since the institution of the dust-control measures recommended in 1937.

1. *Study of the Uranium Mining Industry.*—Other examples of field studies of long duration made by the division that are either in progress or recently completed are: (1) A study of the health of miners in the uranium mining industry, begun in 1950 as a quadri-State project, was an environmental study to determine ways and means of reducing air contamination in the mines to safe levels. Now, 15 years

later, it is continuing as a joint study with the National Cancer Institute with the altered objective of finding the biological changes associated with uranium mining.

2. *Diatomaceous Earth Industry.*—The division's clinical-environmental study of the diatomite industry, a tri-State project involving California, Oregon, and Washington, is another such example of a typical field investigation. Chest X-rays, pulmonary function tests, and clinical examination of more than 1,000 workers were combined with a detailed characterization of the diatomite dust and its environmental concentration with the objectives of (a) defining the nature of the health hazards in the diatomite industry; (b) developing working standards and to devise methods of control; (c) maintaining a biennial chest X-ray followup for 10 years of workers in this industry. The division was gratified to note that within 1 year of the recommended dust-control measures, the industry reported compliance with the dust levels well below those recommended.

3. *Prevalence of Silicosis in Metal Mines.*—A pattern setting 4-year reevaluation study of the prevalence of silicosis among metal miners has recently been made cooperatively by the division and the U.S. Bureau of Mines. Silicosis is still the most common chronic industrial disease, despite the fact that means of prevention have long been known. Presently, known means of protection are based on some still empirical measurements and cannot be applied in all cases in practice. The study was an outgrowth of Hearings on Mine Safety before the House Committee on Education and Labor, Washington, D.C., December 1956. No uniform method of occupational disease reporting has been evolved for the United States,[1] but early surveys made before 1930 showed silicosis rates as high as 30 to 80 percent in specific mines, of which 14 to 60 percent were complicated with tuberculosis.

In the mid-1930's major dust control practices were instituted, resulting in a great reduction in silicosis. From medical examinations, chest X-rays, and lung-function tests made on nearly 15,000 metal miners in 50 mines in 15 States, the crude prevalence rate of silicosis was found to be 3.4 percent; 13 mines had less than 1 percent silicotic miners, whereas 5 had more than 7 percent. Although strict comparisons are difficult, but even allowing for advanced cases that have left employment, these figures represent an extraordinary reduction in prevalence rate and show that control measures that were recommended, if conscientiously applied, can eradicate silicosis. The report

[1] Fogarty, J. E. What Lies Ahead in Occupational Health—A Look at the Next 50 Years, American Industrial Hygiene Association Journal, Vol. 25, No. 2, p. 114 (1964). Issue commemorating 50 years of service by the Division of Occupational Health, U.S. Public Health Service.

of the study, which cost $400,000, will appear as Public Health Service Publication No. 1076.[2]

The primary shortcoming of a prevalence study is that it provides information only for one point in time. This is being overcome by developing a continuing surveillance study through cooperative effort with the U.S. Bureau of Mines. Such surveillance studies will supply data from which it will be possible to predict trends.

4. *Epidemiological Studies in the Asbestos and Soft-Coal Industries.*—Currently in progress also are two large-scale, pressing epidemiological studies involving occupational pneumoconiosis. One is a study related to the asbestos industry, the other to the soft-coal industry. The former's objectives are: (1) to determine the effects of exposure to asbestos fibers and dusts on workers in an effort to resolve the currently controversial question of the possible relation of asbestosis to lung cancer; (2) to develop medical and environmental criteria and procedures for control of health risks in the industry. The objective of the coal mine study is to determine the prevalence, nature, and causation of chest diseases in coal miners in the Appalachian region. Both active and inactive miners are being studied to determine what factors, chemical, physiological or otherwise associated with soft-coal mining predispose toward the characteristic mining disease.

5. *Ergonomics and Stress Evaluation Studies.*—In addition to these examples of multidisciplinary studies, the division has a considerable program in ergonomics and stress evaluation, a combined effort of physiology and enginering units. It has been said recently by an industrial hygiene manager of one of the larger steel companies that, as far as his industry is concerned the only health problems remaining are those arising from stress—heat and noise—chemical problems no longer exist. In accordance with this changing concept, a large physiology section has been developed, and the engineering unit strengthened to meet this challenge, under the very capable and farsighted direction of Dr. Douglas H. K. Lee, Chief of the Division's Cincinnati Research and Training Facility. In addition to the discomfort caused by heat exposure and the hearing loss by noise, these physical agents are being recognized as imposing undesirable stresses on the body that add to the daily wear and tear generally, and in particular, increase the toxicity from chemical exposure. Chief among the field investigations by the division that are gaining further insight into the effects of physical agents are (a) the effects of different types of noise on hearing loss, which may ultimately contribute to the setting

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[2] Flinn, R. H., Silicosis in the Metal Mining Industry, A Reevaluation—1958–61, Public Health Service Publication No. 1076, Washington 25, D.C., 1964.

of noise standards; (b) effect of industrial noise on performance and psychomotor behavior; (c) evaluation of stress in the work capacity of coal miners; and (d) effects of thermal stress in hot industries. In connection with this last project, studies were performed on not only the job, but also in a mobile climatic chamber where conditions could be rigorously controlled. Telemetry studies are planned whereby it will be possible to record worker responses, such as changes in heart rates, during work.

Other Studies.—In this group of field investigations are the special studies involving a single discipline, and firefighting services. Most commonly this discipline is dermatology, because 60 percent of all industrial disease relates to affections of the skin. These are particularly engaging, interesting studies not only because they usually yield the satisfaction of rapid solution, but they are widely diversified in type, and at times lead to surprising discoveries. Note for example, the diversity of the following five dermatological studies of the past 3 years. Toxicity of ricin in castor bean pomace, chromate dermatitis in the cement and railroad industries, arsenical dermatitis in a gold-mining community, chloracnegenicity of 2,4,5-T herbicide, and photosensitivity to pink-rot celery. The first study arose from outbreaks of illness among longshoremen handling castor bean dust as a fertilizer, and the problem was resolved by identifying the quantity of toxic material in bags of castor bean pomace. The study of photosensitivity to pink-rot celery, a potentially disfiguring, blistering response on the sun-exposed parts of the body, resulted in the discovery of a heretofore unrecognized chemical substance responsible for the dermatitis when the contaminated skin is exposed to sunlight.

Laboratory Research Investigations—Toxicology.—As the field investigations problems in occupational health facing Federal agencies differ from those of industry, so do the laboratory research investigations; laboratory research programs of Federal agencies tend to pick up where industry leaves off. Using industries toxicological research as an example of the more than 40 total laboratory research projects currently underway at the Division's Cincinnati Facility, the major effort lies in the three program areas: (1) development of basic information leading to the determination of safe concentrations of chemical substances in air of industrial environments; (2) development of early, sensitive indicators of response to exposure; (3) elucidation of the mode of action of toxic chemicals. A negligible number of industries today devote significant effort to providing information in the first category, and no effort in the last two.

Predictive Blood Test.—Time permits but a few examples illustrative of attempts to provide leadership in preventive industrial toxicology through laboratory research. The Division's Cincinnati

Toxicology Laboratories have described[3] a simple blood test that permits detection of workers hypersusceptible to blood-destroying chemicals. Because it is based on a genetic defect carried in the red blood cells, the test can be performed during the job preplacement medical examination, and thus allow job placement in positions where harmful effects to the susceptible person will not occur. This test, however important it may be as an advanced diagnostic aid, is not so important as the finding that hypersusceptibility may be genetically based. That other genetic defects will be discovered which will permit further delineation of susceptibility and resistance was predicted. Indeed, two additional forms of blood defect related to organic phosphate insecticide poisoning have come to light since this prediction. Others will follow. In keeping with the theme of this conference, "Mobilizing Leadership for a Safety Breakthrough," we feel this advance in preventive toxicology constitutes a significant breakthrough in our understanding of one of the basic causes of individual susceptibility to chemicals.

Beryllium Ores.—In an attempt to anticipate informational needs, a long-term toxicological investigation is being made of ores from newly discovered and widely disseminated domestic beryllium deposits. The Bureau of Mines' characterization of these ores gave rise to concern over a potential health hazard not associated with imported beryllium sources.

Oil Mists.—A similar long-term toxicological study is being made of the health hazards related to exposures to oil mists. Oil mists probably provide the most widespread exposure of any single substance in industry being used in a countless variety of operations and formulations.

Plastics.—The study of the health hazards associated with plastics decomposition products, like the above-described, is on a far smaller scale than is warranted by the magnitude of the problems owing to inadequate resources.

Engineering.—In a similar way, laboratory research in engineering, analytical chemistry, physiology, dermatology, and pathology supplement with basic studies the practical advances made by industry in these fields. In engineering, for example, basic studies are in progress on better methods of measuring and characterizing airborne particulates of industrial interest, measurement of thermal factors in the environment, including the design and construction of mobile thermal chambers, improved ventilation design, development of systems for the protection of workers from thermal stress, and the

[3] Stokinger, H. E., Mountain, J. T., Test for Hypersusceptibility to Hemolytic Chemicals Arch. Environ, Health 6, 495 (1963) ; Mountain, J. T., Detecting Hypersusceptibility to Toxic Substances, ibid. p. 357.

design and construction of new types of recording instruments for measuring physical and chemical agents in the industrial environment. Thus Federal laboratory research strives to fill the gap left by industry.

Publications.—Research findings are of little value unless disseminated. The division makes available immediately the results of its research efforts through several publication media, technical journals, P.H.S. monographs, facility reports and newsletters. Some 137 technical reports and monographs have been published between 1961 and 1963, and 384 between 1953 and 1960. A bibliography of the publications of the division is being brought up to date and will be available later in the year.[4]

Technical Assistance.—The division renders technical assistance in the form of problem-solving services to States, to industrial organizations through the States, and to private individuals through correspondence. If the service requested can be satisfied by letter, it is handled by the information office or by the various specialists; if the service requires on-the-spot technical assistance, survey analysis and reports are rendered by the appropriate technical staff. This short-term investigatory assistance is extremely varied in nature, ranging from chemical analyses of environmental and biological specimens, dermatological investigations, the most common, to survey of a dust problem in borax operations. Present resources limit these services to somewhat less than 500 man-days annually.

Similar, short-term technical assistance, consultation, and advice is provided on a reimbursable basis to other Federal agencies such as the Bureau of Mines, VA Hospitals, the FDA and NASA. Such service averages 300 man-days annually.

Loans of both staff and equipment are also made to various State and local hygiene units.

Another form of State assistance is training in laboratory technics. (See Training.)

Training.—Another way in which the division strives to exert leadership in the field is through education. Short 1- or 2-week courses in occupational health, stressing topics of particular interest to industrial hygiene engineers and chemists, sanitarians, and nurses are given several times each year, limited only by the availability of the teaching staff. Eight such courses were given last year. In addition, a 2-week intensive course in Investigative Technics in Industrial Toxicology is given, the only one of its kind in the country, designed to demonstrate not only the principles and procedures used in industrial toxicological research, but those required for complying with the various recent acts relating to pesticides, food and drugs,

[4] Bibliography of Occupational Health, Washington 25, D.C.

and household chemicals. Students in these short courses numbered 338 in fiscal year 1963, were representative of 14 backgrounds from administrator to technician, came from Federal, State, and local industrial health units, colleges and universities, industries and consulting firms in 35 States and Territories.

Nine field courses of similar technical content were given in cooperation with industrial health units of as many States and Territories. The annual training course budget is $165,000. Training requests exceed resources.

On-the-job training in laboratory technics in the various technical specialties is also provided (engineering, analytical chemistry, dermatology, toxicology, etc.). Over the years many industrial hygienists from various South American countries have been so trained as part of the program of the Inter-American Cooperation Agency, in addition to those from State agencies.

Occupational Health Activities by Other Federal Agencies.—The number of specialized types of occupations that have arisen in recent years as a result of man's attempt to live and work in nonterrestrial environments has resulted in the establishment of special health units that deal exclusively with these problems (NASA, Aerospace Medicine, U.S. Navy Medical Research), or the very considerable reorientation of on-going programs (U.S. Army Environmental Health), particularly in regard to research investigations. It is in laboratory research in these activities that Federal agencies perform a different function than that of industry: toxicology and medicine extends testing to new and unusual conditions of use. Brief mention must therefore be made of these occupational or environmental health activities.

U.S. Navy.—For the past 5 years, this branch of the Armed Forces has been operating a toxicity laboratory that now has a staff of 21 and a budget of $125,000 with additional contractual research funds to develop information on the toxicity of air contaminants peculiar to and under conditions of long-term submergence in atomic submarines. From such data may be developed limits of safe exposure of submarine crews. Habitability studies are done elsewhere under contract.

A strong occupational health program has been in operation for many years for the 338,000 Navy employees that operate the 25 shipyards and other Navy installations. Each of these installations has at least one industrial hygienist and a small technical staff, for a total of 42 industrial hygienists. Sixty civilian industrial physicians with part-time help from Navy physicians in some installations fill out the health program for a total of about 150 man-years. This represents an employee industrial health coverage of 2,260 per industrial health officer.

U.S. Air Force.—In addition to the various contract support laboratories of environmental health at the several Air Force bases, there are two recently established research laboratories, one of Aerospace Toxicology (Budget $329,000) whose major mission is to determine safe concentrations of air contaminants for prolonged space travel. In this laboratory, equipped with novel and unique exposure chambers, the toxicity of air contaminants, both singly and in combination, may be tested under simulated space-flight conditions on animals and ultimately on man. The other laboratory, equipped to study the toxic hazards of propellants and materials, is budgeted at $975,000. Most of the work is contracted out, but slightly over $200,000 goes for the 16 in-house man-years, equipment facilities, travel, etc.

One hundred and fifty environmental engineers, in a ratio of one or two engineers per base, supported by three or four technicians, perform an extensive sampling program at the missile flight centers. Combined with an effective medical surveillance, the 144,000 civilian employees of the Air Force are provided with specialized occupational health service.

U.S. Army.—Responsibility for the environmental health of its civilian employees, as well as the military is vested in its Environmental Health Agency. A staff of 120, including physicians, industrial hygienists, engineers, chemists, health physicists, and nurses provide direct health care for about 312,000 personnel, including those in contract-operated plants located in 110 industrial-type operations. An additional 973,000 receive indirect benefits. Routine environmental surveys are made biennially, special surveys on demand. A start has already been made to develop local area facilities capable of performing routine surveys to insure followup of recommendations made at AEH headquarters.

In addition, the agency has recently established a small research laboratory for detailed study of the toxic hazards of chemicals used under the special conditions of troop activities.

U.S. Coast Guard.—This branch of the Armed Forces has at present only a token industrial hygiene unit, and depends on other Federal agencies for consultation, advice, and services. Its major occupational health problems (handling and transporting bulk chemicals) present little in the way of unusual exposure.

NASA.—This Space Administration, in addition to providing an intensive air-monitoring program at each of its far-flung space-capsule firing sites, has an extensive medical research program on the effects of space travel on human physiology, and related problems, all of it performed by the individual aircraft contractors.

AEC.—The Atomic Energy Commission, through its 12 operational offices throughout the Nation, maintains an exceptionally strong occu-

pational health surveillance program, both of its own personnel and that of its numerous contractors, which total 130,000 employees. The New York directed operations have from 15 to 20 contractors involving an estimated 5,000 workers. Monitoring by the individual contractors is encouraged, but a staff of three in the New York office supervises these activities.

National Advisory Center on Toxicology.—All of the above Federal agencies rely on this information center for consultation and advice, of which each are financial sponsors. Functioning as a unit of the National Research Council, the Advisory Center relies, in turn, on a Committee on Toxicology, chosen by the NRC.

Bureau of Mines.—This Bureau has statutory responsibility for health and safety in coal mines for coal mine fires and coal mine inspection, and conducts health and safety studies in the mineral industries generally, major emphasis being placed on safety. The staff assigned to this work numbers 695 and operates with a budget of about $9 million.

Activities of State and Local Occupational Health Agencies.—There are currently 41 States and Puerto Rico with some type of occupational health unit; 16 of these States have a combined total of 36 local units. Nine States do not have a unit of any sort. The governmental industrial hygienists staffing these units number about 700. Table 1 shows budget and staff of four State occupational health units and one city unit with average number of industrial (excluding agricultural) workers, and the per capita cost per year for occupational health service. One of the larger city units, Detroit, has a staff and budget larger than that of Massachusetts. Interestingly, the amount of money spent by the city health unit is considerably higher than that of any of the four States selected (36 cents vs. 11–13 cents). This is to be compared with 6 cents per worker spent in addition by the Federal unit. The average number of industrial workers per occupational health staff member is very high, running from a high of about 79,000 to a low of about 33,000 for New York. For some States, the proportion may be double this number; 100,000 workers per staff member, however, represents the average not uncommon to many of the less industrialized States. This is a far larger number of workers than industry assigns to their industrial hygiene staffs; in one large company with a well-developed industrial hygiene department, the ratio is 1 to 2,500 (55 staff, 135,000 employees). This is well *below* the ratio of one industrial hygienist for each 24,000 workers recommended as a desirable goal providing adequate benefits of industrial hygiene to the worker.[5]

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[5] Baetjer, A. A Reevaluation: Future of Industrial Hygiene. Presented at American Industrial Hygiene Association Conference, Detroit, 1961.

TABLE 1. *Budget and Staff of 4 State and 1 Local Occupational Health Units*

	Massachusetts	New York	Pennsylvania	Michigan (except Detroit)	Detroit
Total Funds	$122, 000	$659, 900	$488, 700	$275, 600	$275, 000
State	110, 000	556, 339	295, 700	269, 300	255, 000
Public Health Service	[1] 12, 000	[2] 93, 561	193, 000	6, 300	[3] 20, 000
Staff (professional and nonprofessional)	15	80	60	36	23
Number of workers	951, 000	6, 320, 000	3, 726, 000	2, 135, 000	760, 000
Average number of workers per staff member	63, 000	79, 000	62, 000	60, 000	33, 000
Cost per worker per year	$0. 13	$0. 11	$0. 13	$0. 13	$0. 36

[1] 5-year annual DOH research grant.
[2] Radiologic-health funds.
[3] Health Department funds for air pollution.

Table 2 summarizes some activities of the same five occupational health units. The number of industrial plants visited range from hundreds to several thousand annually, and this is true for large city units like Detroit as well. Although in somewhat fewer than 50 percent of the plants visited were environmental samples taken, yet the number of these analyses ran into the tens of thousands. Despite this relatively large effort, only a small proportion of the plants in any one region can be visited even annually. This is so because many of the places visited are the small workshop type with fewer than 100 employees. It is noteworthy that of the many recommendations made for improving health conditions, compliance by management was reported as good (well above 50 percent) by all but one of these five units. Compliance is reported as essentially complete in Detroit owing to its very good factory inspector system. Table 2 shows that although the type of problem varies with the region, those associated with carbon monoxide, silica, solvents, dusts, air pollution, and radiation are the most common.

Current Difficulties in State and Local Occupational Health Units.—As is readily apparent from the foregoing, the budgets and staffs of State and local occupational health units are far too inadequate to perform the necessary monitoring of the numerous plants and workshops too small to afford their own industrial health program. In too many State health units, salaries are not sufficient to retain physicians, engineers, and chemists. In particular, interest in occupational health in many State health departments is low or

lacking, and many units have been maintained as a result of becoming involved more extensively in other activities, such as radiation and air pollution.

The low salary scale has led to another deficiency in State and local units. Few units can attract industrial physicians to their staff, and consequently these units, having no facility in medicine, can perform purely environmental engineering studies and the clinical side must be ignored. In a few units, this is compensated in part by the director also being the physician.

A third deficiency is the almost complete lack of a research program. Only a handful of States, notably California, Texas, Massachusetts, New York, and Pennsylvania, have a significant amount of sustained effort devoted to research on industrial health problems. Without the stimulation of research, there is the tendency to drift to routine performance of tasks without imagination and insight. Correction of these deficiencies has been made in several health units by foresighted, strong direction and sympathetic directors of State health departments.

TABLE 2. *Activities of State and Local Occupational Health Units, 1963*

	Massachusetts	New York	Pennsylvania	Michigan (except Detroit)	Detroit
Number of plants visited.	400	3,500	6,876	3,300	2,425.
Number of visits.				6,600	6,500.
Number of employees.	8,000 of 40,000 total.		665,000 estimated.	380,000	196,800.
Number of plants sampled.	45 percent	49 percent	14 percent	40 percent, 2,500 field detms.	18,140 measurements, 16,450 analyses.
Number of recommendations made.	400 estimated	1,500 estimated.	1,156	2,740	1,250 workplaces, 2,170 Corrections.
Compliance	Above 50 percent.	Above 50 percent.	39 percent	60–70 percent estimated.	66 percent; 90 percent by 1964.
Types of problems.	Carbon monoxide, lead, dusts, plastics, beryllium, solvents, mercury.	Carbon monoxide, silica solvents, lead, dusts.	Pneumoconiosis in coalminers, slate quarries, explosives, asbestos, tunnel drilling, radiation.	Carbon monoxide, silica, solvents, spray finishing, adhesives, inadequate maintenance, improper respiratory equipment.	Defective ventilation, air pollution nuisances, control of ionizing radiation.

Summary

A review has been made in some detail on the activities of the Division of Occupational Health, both of its field and laboratory investigations, the nature of its technical assistance and its training programs.

The programs in environmental health of the Armed Forces, Space Agencies, and other Federal groups have been mentioned very briefly.

The activities and deficiencies of the State and local occupational health units have been summarily discussed.

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Panel Member Frank S. McElroy (2d from right) answers a question raised during workshop discussion: "Using Records To Prevent Accidents." Other panelists (l. to r.) are H. Gene Miller, Henry J. Gmeinder, A. F. Romig, and Henri P. Lacroix. Members of the panel not shown in the photograph are E. C. McFadden, Eugene N. Pollock, and George F. Nuernberger.

WORKSHOP: USING RECORDS TO PREVENT ACCIDENTS

Moderator: E. C. McFadden, *Vice President, Texas Employers' Insurance Association*

Opportunities in Records

Mr. McFadden

As stated in the scope of this workshop, the action word in the title of our session today is "using." Therefore, our objective at this time will be to concentrate on ways to put records to work to prevent accidents. Regardless of the type of safety records that may be available, they can provide various avenues of utilization in improving safety results. In some instances, minor changes can be made in them which will further add to their value.

Accident records afford many opportunities for use in accident control. They can serve as a valuable "safety tool" in all safety programs. Capitalizing on opportunities existing with records can, in a large measure, contribute to the safety breakthrough which is set out as the objective in the theme of this conference. One large steel company in promoting its safety program has stressed that "knowing is not enough." The same is true about records—the mere completing and filing of records is not enough; they must be used in every beneficial way possible. Let us look at some opportunities available through records.

Accident Records Provide Statistics for a Measure of Results. Data on number and severity of accidents and exposure base enable a comparison of safety results between departments and divisions within an organization. Likewise, comparisons can be made between companies and industries. Through the use of records, the Architectural Woodwork Institute found its industry was paying for six times as many disabling injuries as the average of all manufacturers reporting to the National Safety Council. The Milk Industry Foundation discovered, prior to initiating a safety program within their industry, that it was six times more dangerous to work in a fluid milk plant than it was to work in a steel mill. Statistical research further developed

that a $100 accident would nullify the average profits (½ cent) on 20,000 quarts of milk. For many plants, this may represent the entire profit of the fluid milk deliveries for 1 day.

Many industry associations accumulate accident data from their member companies, and publish monthly or quarterly a comparative standing on their injury-frequency rates. The listing is usually by code number so as not to publicly embarrass those companies with adverse safety experience.

Through the use of accident records, companies and industries are able to chart over a period of years their safety progress, or lack of it. For instance, the members of the Gypsum Association improved their safety record 73 percent in 12 years; the Can Manufacturers' Association reduced its members' frequency rate 60 percent in 5 years; and 39 member mills of Pacific Coast Association of Pulp and Paper Manufacturers reduced accident frequency 84 percent in 14 years. Pressed Metal Institute stated one of the greatest contributions to its members was the reduction of 50 percent in the frequency rate during its operating span. The use of statistics in this manner will reflect trends and can be used to give impetus to safety efforts.

For comparisons with other organizations, it is necessary that a standard method be applied in developing statistics in order to obtain uniformity and to exercise a common criteria for a yardstick.

Accident Records Can Give Direction to Safety Efforts. Let us assume that an organization has used accident records in developing information which reflects an adverse safety position in relation to others in its industry, or that the trend of the work-injury rate of the company or industry is above the averages developed by the National Safety Council and the U.S. Department of Labor's Bureau of Labor Statistics. This should pose a question as to *why?* Research should then be conducted of accident records to determine this information.

A study of accident records in such areas as specific operations, processes, materials, equipment, and work practices will normally disclose the problems. A high ratio of accidents may be reflected in connection with certain equipment in a particular department, such as a press in a cottonseed-oil mill. Possibly, a new chemical has been introduced into a process that is causing a serious occupational disease condition among employees; i.e., use of wood preservatives in a sawmill. In some instances, it may be found that the total number of accidents is about the same, but there is a big increase in accidents with substantially higher serious consequences, such as employees trapped in cave-ins during excavation on construction jobs. It may be that a high ratio of employees are getting injured in the first week of work as the result of inadequate screening and training.

Through the use of accident records, the major causes can be deter-

mined. With this information, direction can be given to the development of corrective measures for the elimination of such accident causes. In large companies with multiple operations and in many associations, it is often the practice to compile and publish digests on major accident causes disclosed in accident reports, and recommend ways to guard against the particular hazards.

Other Uses of Accident Records. Data in accident reports can provide a basis for conducting safety contests and the giving of special recognition. When desired, the departments and companies can be grouped by size and comparable hazard exposure.

Accident records can provide tangible means for alerting management in industry. Management can usually be motivated to take action when presented with accurate comparative data reflecting good or adverse accident prevention results.

Good safety performance, when reflected in accident records, can be utilized to enhance the image of the company and the industry. This can be beneficial in the areas of public or community relations, customer relations, and employee relations, plus the stimulus that such publicity gives to the continuation of the safety program.

Designing and Processing Accident Reports. It is highly desirable to include questions that will obtain data under a recognized system such as American Standards Association Z–16.1. The report should be patterned to serve a multipurpose, such as to provide statistical ratings and give information for guidance in developing corrective action.

Organizations dislike to prepare duplicating information. An effort should be made to explore coordination with other similar data currently being provided; for example, the reports to insurance companies on workmen's compensation accidents, Bureau of Mines of the U.S. Department of Commerce, etc.

A procedure should be established for the prompt handling of accident reports. The feedback of information developed from accident data is vital in fostering the continuation of the submission of accident reports. Those who prepare such reports need to be shown continually the benefits of their efforts.

The structure of the panel of our workshop has been assembled by special design. We have four (or five) different speakers representing the small company, the trade association, the State, and the large company. All have different sources of records that can be effectively used in giving situations to eliminate accidents. At the conclusion of all talks, there will be a discussion of questions from the audience. It is hoped that each subject will stimulate numerous questions. The manner and extent to which the audience participates can play a big part in the success of our workshop today.

Records as Tools for Safety Action

EUGENE N. POLLOCK, *President, Industrial Group Service, Inc., New York, N.Y.*

Before launching into my topic for today, and with your indulgence, I would like to explain briefly what our organization does. We are retained by Employers Trade Associations in New York State to establish and manage Workmen's Compensation Insurance Safety Groups. These groups operate on a cost-plus basis with the carrier being the New York State Insurance Fund. Members receive an advance discount at the beginning of the year and a dividend at the end of the year. The amount of the dividend is determined by deducting compensation insurance losses and an expense factor from the total premiums paid by the members during the year. As part of our service, we provide an accident-prevention service which supplements that of the State Insurance Fund.

In all of our groups, we deal basically with small business firms. We recognize that while most employers have the desire to prevent accidents, they must be motivated to take safety action. The desire to prevent accidents is there, but the normal business pressures usually result in their relegating safety to something which can be taken care of some day, when they get around to it.

It is my intention to demonstrate to you today that records can be used as tools to motivate management to take action now, not at a later date.

Each member is advised that he benefits directly by the prevention of accidents. He is told that every dollar he saves in losses increases his dividend at the end of the year. At the same time, the records are utilized to show that the same dollar saved reduces his individual compensation insurance rate, through the experience rating plan and, still further, that this same dollar saves him as much as $4 in indirect costs, by preventing damage to valuable machinery, interrupted production, and the loss of keymen.

In order to convince management of the need for safety action, we make extensive use of safety records. I think the best way to illustrate how we use these records would be to relate what we have accomplished with one firm from the time they became a member of our Hollow Metal Door and Buck Association Safety Group to the present time. The firm, the Williamsburg Steel Products Company, manufactures hollow metal doors and bucks and had approximately 500 employees at the time we took them over. They were then operating on an experience charge of 27 percent, which made their rate 27 percent higher than the average for the industry.

After a study of their prior experience, a safety program was tailored especially for them with which management promised to cooperate completely. It was agreed that monthly safety meetings would be held and attended by the plant supervisory personnel and representatives of management. Management also agreed with our suggestion that plant supervisors be given every opportunity to comply voluntarily with the safety recommendations which we would make at these meetings. However, if after a reasonable period of time, satisfactory progress was not being made, then management would take the necessary corrective action to achieve the desired results.

From past experience, we knew and anticipated resistance to our suggestions on the part of plant personnel. We knew that they would have to be won over and sold on whatever recommendations were to be made. We knew that we would need effective ammunition to overcome this resistance of plant personnel and some representatives of management. The ammunition was provided by the records we utilized and they fell into two categories.

1. Records used to convince plant personnel that action was needed. These would reveal the hazards, frequency of accidents, types of accidents, and locations where they were occurring.
2. Records used to sell management on the premise that the program was *worth* the time and expense being devoted to it.

In the first category, we used the following records:

1. A standard inspection form.—To be used at the outset by our representatives and the safety representative of the State Insurance Fund, each of whom would make a weekly inspection. A copy of the inspection report would be left with the plant superintendent and a copy would be retained in our office.
2. A foreman's accident-report form.—The foreman would be required to give all necessary details relating to the accident and also to draw certain conclusions from it. He would have to state what the employee was doing when the injury occurred, including use of tools, machineries, and materials; how he was injured, what he did unsafely, what was defective, in an unsafe condition, or wrong with the method being used; what safeguards should have been used; and what steps he took to prevent a recurrence of this type of injury. A copy of this form would be sent to the dispensary, and the foreman would retain one.
3. The employer's report of injury (standard C–2.5 and C–2 forms).—These forms would be made up by the nurse from the

foreman's report. They would be forwarded to our office, in triplicate, together with the foreman's report. We, in turn, would forward copies to the State Insurance Fund and the Workmen's Compensation Board, and retain one copy for our files.

4. A medical summary.—The medical summary recorded all injuries, first aid as well as reported accidents, by nature of injury, department, and parts of body injured. This would be prepared by the nurse and forwarded to our office each month.

In the second category, records utilized to sell management on the need for safety action were:

1. An employer's chronological accident record. When we received the employer's report of injury, it was immediately entered on the employer's chronological accident record by month. It showed the date of injury, employee's name, description of injury, part of body injured, department, and a space provided for both compensation and medical cost.
2. A summary of accidents.
3. An analysis of accidents.
4. Causes or trends.
5. Cost estimates.

All of the above records were kept in our office and were derived from the employer's chronological accident record.

At the monthly safety meeting, our chronological accident record was reproduced in sufficient quantities to be distributed to the plant supervisors. The copy which they received did not show any compensation or medical cost estimate. The safety meetings were attended by the plant supervisors, the plant superintendent, and the production manager. The meetings usually began with a discussion of the inspections made during the month by the person making it using his inspection reports. Each supervisor then reported on the steps he had taken to correct the hazards which had been pointed out in the inspection reports. Each accident occuring during the month was then reviewed in detail by the supervisor of that department, utilizing the copy of the foreman's original report.

Similarly, top management would also receive a reproduction of our employer's chronological card for each month. However, it was our policy to keep management constantly aware of the high cost of accidents. The card, therefore, would also indicate a compensation and medical reserve, set up by our office, on each accident reported during the month. This would be attached to a letter analyzing the accidents for the month by type and location, showing causes and trends, and a

summary showing the total estimated losses for the month. In the same letter, an estimate of the monthly premium and a resulting loss ratio would be shown. This would be cumulative from the beginning of the policy year, and management would be advised of the effect of this loss ratio upon their compensation insurance rate.

Management had advised us at the outset that they had an effective safety-shoe program. They were paying each employee $3 toward the purchase of a pair of safety shoes, and they had vouchers showing the purchase of approximately 500 pairs of shoes. Despite this, at the first meeting, out of 17 plant supervisors attending the meeting, only 2 were wearing safety shoes. A review of their past experience indicated a high frequency of toe injuries and, as might be expected, our early inspections showed that plant employees were wearing safety shoes at about the same ratio as the supervisors. After some initial resistance, all supervisors were won over to the idea that in order to have an effective program, they must set the example—by wearing safety shoes in the plant at all times.

The usual resistance developed. Complaints were received that the shoes were too heavy, too cold in the winter, too warm in the summer, etc. At first, wearing safety shoes was mandatory only in certain departments. When the records continued to show toe injuries in other areas, both the plant supervisors and management agreed that it should become company policy to allow no one to work without wearing safety shoes. The shop steward did not oppose the policy, but actively cooperated with it. When this policy was instituted, toe injuries were virtually eliminated and, within a few months, all complaints had disappeared. Wearing safety shoes in the plant had become a habit.

The safety glass program followed the same development. Most supervisors felt there were few eye injuries occurring in their departments. The records soon showed, however, that while there were only a small percentage of reported eye injuries, there was a very high frequency of first-aid cases. Again, the records were utilized to convince the supervisors of the need to enforce the use of safety glasses, at least in those areas with the greatest exposure such as spot-welding, grinding, etc. Again, the progress was slow but the inspection reports soon revealed the reason. Many employees in the areas were not complying with the rule and the foreman was not enforcing it. Eventually, almost complete enforcement was achieved and accident frequency in the areas dropped sharply. However, the records then revealed at the meetings that eye injuries were occurring to employees other than those working in the danger areas. The inspection reports, which were confirmed by the accident records, showed that these were occurring to employees walking through the danger areas without safety glasses.

The recommendation was made by the supervisors that these people be required to wear glasses when passing through danger areas. Again inspection reports revealed that many employees were not complying with the rule and the accident records continued to show eye injuries persisting.

I must confess that it took quite some time but, eventually, it was agreed that the only way to eliminate eye injuries was to make it mandatory for all employees to wear safety glasses at all times within the plant. Eventually, this was even extended to visitors within the plant. Although our monthly reports to top management showed a gradual reduction in frequency and also in accident cost, it was only at the beginning of the third year that the effect of this was seen in his compensation insurance rate. The impact was dramatic, for at the beginning of the third year, the 27 percent experience charge had been converted to a 1 percent credit. While we had been able to secure the continuing interest and cooperation of management up to this time, this was the clincher. In the following year, the credit increased to 11 percent; the next year to 12 percent. Not only was top management now sold on the program but the production manager who, at the beginning had felt that the program was interfering with his production, now threw himself wholeheartedly into the program. He devised, with our cooperation, an incentive system for foremen which resulted in bonuses being awarded to them at the end of the year based upon their safety performance during the year. As of this year the experience credit has risen to 29 percent and gives indication of going higher next year. This has resulted in a 56 percent reduction in their individual rate from the date the program began. In terms of money, it means that the firm is now paying a workmen's compensation premium of $55,000 with 750 employees whereas at the time it was instituted, the premium was $94,000 with only 500 employees. In our reports to management, we pointed out that had the experience continued as it was prior to the institution of the program, their premium would have been in excess of $120,000 instead of the present $55,000.

In the past several years, not only top management, but the production manager as well, have continually looked for new ideas to sustain interest in the safety program. About a year ago, a supervisors' training course was instituted which ran one hourly session per week for 7 weeks. It was given after hours, and the supervisors were paid overtime for attending the course. This was so well received by the supervisors, that the same course was given to the foremen on the same terms. Management is now contemplating extending it further down the line to leadmen.

While we cannot claim such excellent results in all cases, we can state that this approach has been generally successful for the firms in our groups.

Safety is like morality. Everyone is in favor of it, or, if they are not, they will refuse to admit it. However, safety action and an effective safety program are something else again. In order to have this, both the labor and management components of a firm are "from Missouri." They must be shown. Only facts can convince them. Safety records can provide the facts, and, as such, are the tools that can motivate both labor and management by showing the need for, and dramatizing the results of, safety action. Their proper use can ensure the success of any safety program.

The Dependence of the Small Shop on Outside Statistics and Administration for Effective Safety Management

WARREN A. PETERSON, *President, Peterson Products Corporation*

Peterson Products Corporation is a job shop in the metal stamping business. Our plant is approximately 50,000 square feet, located in a suburb of Chicago. We employ approximately 60 people. Thus, I feel, we are typical of the many small manufacturing operations that compose a substantial element in the national economy.

In a small operation, it is necessary that an individual administrative employee perform many jobs. For example, our chief engineer is solely responsible for tool design, specification of equipment to be purchased, plant and equipment maintenance, job cost estimates, work standards, overall supervision of plant operations and personnel, and safety. In addition, he consults with customers and suppliers on engineering, metallurgical, and equipment problems and cooperates in establishing and maintaining production schedules. In a larger operation, quite often each of these functions would be handled by a separate individual or group.

Similar to the multiple functions of administrative personnel, our supervisors are kept to a minimum number. They are required to handle a vast range of functions covering our many varied operations, though the number of workers directly supervised normally would not exceed 25 men.

Our manufacturing equipment includes straight side single and double crank, OBI, horn, gap frame, and double action mechanical presses, hydraulic presses, square and rotary shears, special trimming machines, cutting lathes, seam, spot and projection welders, grinders, and drilling and tapping machines. Our toolroom is equipped with

lathes, various types of grinders, drill presses, a shaper, mills cutoff and band saws. We do furnace annealing, acid pickling, bonderizing and plating on a production basis. Our material-handling equipment includes monorail and bridge cranes and electric, propane, and hand-powered fork trucks. We operate mechanical, electric, and air actuated automatic press feeds with coil reels, cradles and straighteners. In addition, our maintenance department has an electric arc welder, a gas torch, and a sizable assortment of powered handtools.

Disregarding the items I have overlooked, this assembled equipment represents a potential accident hazard substantial enough to satisfy operations many times our size.

Because we are a job shop, our operating employees perform a wide variety of production and service jobs as the need arises. Having no end product or any great degree of consistent contract manufacturing, it is virtually impossible to schedule one individual for only one or two operations or machines.

This situation creates a difficult training problem to be handled by supervisors who must then devote time to training new men while performing all their other production functions.

Our difficulties in this area were dramatically pointed out by our accident record in the years 1948 through 1952. During this period, we hit a high frequency rate on lost-time accidents of approximately 120 and averaged 70.

Under pressure from our insurance company and the State, as well as the obviously high cost of such a record, we were desperate to find an immediate solution. Our own records offered little in themselves, inasmuch as our great exposure gave us a wide range in type and cause of accidents.

It was fortunate that at this same time the Pressed Metal Institute (now named the American Metal Stamping Association) was at work formulating a coordinated plan to reduce accidents in metal stamping plants.

We adopted this plan as a means to direct the time and attention of our administrative and supervisory personnel to those areas where the greatest gains could be made.

It was obvious that more than time and attention were necessary to bring about the needed improvement. Cash for the purchase of safety devices and equipment had to be set aside from that which was being invested in the rapid expansion of our business. It was, therefore, necessary that such purchases be the best for our purposes and offer the greatest possible protection against the continuation of our high frequency rate.

Here again, it was possible to use the services of the PMI (AMSA) to aid in our selections. Through contacts with other members and

the professional advice of Associate (Service) members, we were directed to those items which best fit our needs. This was accomplished with a minimum of effort on the part of our people with the added benefits of vastly increased knowledge of accident-prevention techniques.

There was an increasing awareness of the interest that had been developed in safety, and the effects of this interest and effort soon became apparent. Accident frequency and severity were reduced dramatically.

On a continuing basis we drew constantly from the aids provided by our trade association. These aids took the form of (1) Suggestions of how a plant of our size can economically and efficiently set up a worthwhile and sensible safety administration and training program. (2) Timely reports on equipment, hazards, training and prevention aids, etc. (3) Local and national meetings dealing specifically with safety topics, including presentations by professional safety men as well as individuals from member plants who had successfully met the challenge of safe, profitable operation. These meetings were also important in that they provided the common ground for the informal interchange of suggestions to meet this common problem based on the much larger field of experience than is available in the smaller plant. (4) Comparative and composite annual statistics which aid in pinpointing trouble areas for each operation to watch. (5) A service available to any member to seek answers to specific problems both through historical records and individual surveys of all member plants.

These aids and services, though managed by the full-time personnel employed by the Association, are planned, organized, and administered by a standing committee composed of management and supervisory personnel of member firms, and representatives of safety equipment manufacturers, insurance companies, and the National Safety Council. This committee, meeting two to four times annually, acts as would the combined administrative safety committee of a large industrial firm.

The value of these services cannot be accurately assessed in terms of actual dollars. However, the results we have achieved in the past 10 years lead me to estimate the annual savings at more than $10,000 annually, which is a considerable sum in anyone's organization.

We are proud of our improvement which, in the past 10 years, included a span of 4½ years without a lost-time accident, and a period of nearly 7 years between lost-time accidents involving the actual operation of our power presses. I like to attribute our improvement directly to the continuing cooperative efforts of the American Metal Stamping Association.

Work Safety Informational Services Provided by Wisconsin Industrial Commission

Henry J. Gmeinder, *Chief Statistician, Wisconsin Industrial Commission*

In one of his recent speeches, President Lyndon B. Johnson announced his plan for a "War on Poverty." In Wisconsin, another plan is being effected but in a different direction—a "War on Industrial Death, Injury and Disease" by the Industrial Commissioners and others of our State.

Our objectives have been defined. Certain fronts are already established. Our reconnaissance and mapping are well under way.

Those of us who compile work-injury statistics and provide safety information services, strongly believe in the old adage "The pen is mightier than the sword." That is our part of the fight.

Some smart aleck once said that statisticians collect facts and draw their own *confusions.* What actually happens in the accident or injury prevention field is that statisticians collect facts from past injury experience that have grown out of confusion—of disorder—the hotbed of the subversive elements of death, injuries, suffering and pain, resulting from industrial accident and disease.

Perhaps the fault is ours—those of us who work with these statistics—that more has not been done in the reduction of accident-producing injuries. Perhaps there has been too much confusion from our facts and figures; perhaps we are too much propeller and not enough rudder.

Horsesense is the beginning of a stable life. We should learn from past experience. A little commonsense in the presentation and use of our statistics will go a long way toward softening up the enemy.

I will confine my remarks mostly to the battlefront in our dairy State. The chiefs of staff are primarily the generals in our Commission and the generals in our Wisconsin Council of Safety. Our injury statistics provide the intelligence reports on which these generals and others base their course of action. Our injury statistics also broadcast the "Voice of Accident Prevention" for labor and management.

Our Wisconsin Industrial Commission's Statistical Division supplies data on a large range of subjects. One of its major programs is the preparation of workmen's compensation statistics for accident prevention purposes. One of the principal objectives of our Wisconsin Workmen's Compensation Act is "to provide means of minimizing the number of accidents in industrial pursuits." An allied program is our injury-frequency and severity-rate survey. Together, these two programs have been useful in setting up safety programs for trade

associations and others, and have led to the creation of special committees to study the safety problems of certain hazardous industries.

The following information is regularly coded and punched into IBM cards for all cases closed under our workmen's compensation law. Many of them are also coded and punched into IBM cards when the case is first reported.

1. Industry. Reporting establishments are classified on the basis of their major activity. These classification codes enable us to classify and pull out the injury data according to the principal kind of work done by members engaged in the same industry or by members of any given trade group. These codes are assigned in accordance with the Standard Industrial Classification Manual of 1957.

2. File number. Each employer, injured employee, and insurance carrier is assigned a file or code number. By use of the employer number we can combine the experience of all the members of any given trade group or for any individual employer.

3. Place. Our codes tell us where the injury occurred—by county and major city.

4. Age, sex, and occupation of injured employee. In 1962, between 4 and 5 of every 100 work injuries were incurred by foremen and professional, managerial and technical occupations. These injury cases accounted for about $6.50 out of every $100 payable in indemnity. It is difficult to sell safety if these men have not bought safety themselves. The foreman is usually concerned with getting the work done as fast and as efficiently as possible. There are exceptions of course—like the foreman who was ordered to check up on his best friend who was suspected of loafing on the job. He found his friend sitting in the shade, lazily chewing on a toothpick. On return, his report was literally true: "I found the man in question working like a beaver."

5. Kind of disability. This kind of classification tells us whether the man died, was permanently disabled, or whether he was only temporarily disabled. It also tells us what kind of permanent disability the injured man suffered.

6. Nature of injury. The nature of injury classification identifies the injury in terms of its principal physical characteristics, and points out the basic injury.

7. Part of body injured. The part of body affected or injured classification identifies the part of the injured person's body directly affected by the injury previously identified.

8. Healing period. Represents the actual time off from work because of the injury or disease.

9. Compensable time. Gives the time period over which indemnity (compensation) and death benefits were paid or are payable.

10. Percentage loss of use of part of body in permanent-partial disability.

11. Dependency in fatal cases.

12. Source of injury. The source of injury identifies the object, substance, exposure, or bodily motion which directly produced or inflicted the injury.

13. Accident type. The accident type identifies the event which directly resulted in the injury. Our definitions and rules for selection on nature of injury, part of body affected, source of injury, and accident type categories, follow the basic concepts of the American Standard Method of Recording Basic Facts Relating to the Nature and Occurrence of Work Injuries, Z16.2.

14. Penalty. Injury cases in which the claimant is entitled to increased or decreased indemnity and death benefits are classified by type of violation and amount of increase or decrease in compensation.

15. Average weekly earnings of injured employees.

16. Amount of indemnity or compensation paid or payable. This is available only after the case has been closed.

17. Amount of medical aid paid. Our tabulations do not reflect the medical aid paid to the thousands of temporary injury cases involving less than 4 days of disability where no indemnity is payable. These cases are not reportable to our commission.

These items are probably the most useful in preparing and organizing our studies for trade groups and others. However, we also keep records on other types of workmen's compensation data such as promptness of first payment, report lag, formal hearing, etc., which are not as closely associated with accident prevention as the other factors which I have enumerated.

The other major source for injury rate data is our work injury rate program under which the data are collected in cooperation with the U.S. Department of Labor. Presently, we are compiling standard injury rates for manufacturing, contract construction, and State governmental agencies. These rates are compiled according to the provisions of the American Standard Method of Recording and Measuring Work Injury Experience, Z16.1.

Standard injury rates are based on all disabling or lost-time injuries and are not limited to those with four or more days of disability as under our Wisconsin Workmen's Compensation Statistics Program.

On our injury rate surveys, we also code the industry and employer file number. The place code tells us where the reporting establishment is located. Other types of information compiled under this program are:

1. Exposure data. This includes the average number of employees and total hours worked by all employees.

2. Number of deaths incurred and time charges assigned.
3. Number of permanent impairments and corresponding time charges assigned.
4. Number of temporary disability cases involving 1 to 3 days' disability, 4 or more days' disability, and repaired hernias, and days of disability for each group.
5. Number of medical treatment cases where such records are available.

Other types of data compiled by our Industrial Commission, which also have great value in special injury studies, include employment estimates by major industry groups, earnings and hours estimates for manufacturing industries, and covered wages and employment under the Unemployment Compensation Act of Wisconsin. Manual premium rates and applicable classifications are contained in the Workmen's Compensation and Employers Liability Insurance Manual issued by the National Council on Compensation Insurance. The State of Wisconsin Department of Insurance and the Wisconsin Compensation Rating Bureau have much valuable premium and loss data for insured employers and their insurance carriers.

Our Industrial Commission data are punched into IBM cards, thus we can put together and provide quite a variety of injury information and related data.

Monthly releases on workmen's compensation cases reported to the Industrial Commission and annual releases on these cases after they are closed showing amount of indemnity and medical aid paid have been issued for many years. Our mailing list includes labor, management, government, libraries, etc.

In its 1960 annual report, our Wisconsin Council of Safety noted that the leveling off trend in Wisconsin work injury cases indicated "the need for a new approach" in further reducing such occupational injuries. This *need* triggered Wisconsin's present work injury program.

Who have been the beneficiaries of our injury rate data? I like to think that everyone in Wisconsin has benefited—labor, management, the public, our own commission, etc. Safety or the lack of safety affects everybody.

More specifically now, what have we accomplished?

1. Through our work injury program, inaugurated in 1961, the year in which our Industrial Commission celebrated its Golden Jubilee, we have given Wisconsin manufacturing and construction industries an indicator or measure of their problems and accomplishments in terms of standard work injury rates by industry, area, size, etc.

2. The comparable standard injury program for State of Wisconsin employees was started on January 1, 1964. In announcing this pro-

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gram, Governor John W. Reynolds said: "An intelligent attack on the accident problem must be based on accurate knowledge of accident experience. More than 7,000 private manufacturers and construction contractors provided the Industrial Commission with this information earlier this year. Should the State of Wisconsin as an employer do less?"

3. We have provided the steering committee of the Wisconsin Council of Safety with a comparative work injury rate record. Incidentally, the manufacturing concerns belonging to the Council have been experiencing an injury-frequency rate only half as high as the companies that do not belong. We have pointed out to nonmembers that assistance on safety programs is available from the Wisconsin Council of Safety.

4. We dovetail and supplement injury rate statistics with workmen's compensation statistics or vice versa, where feasible. We like to feel that our special reports were responsible for the formation by our Commission of various special committees, most notably a special committee for the construction industry and another for logging. Labor is also represented on these committees. We also like to think that our special report on State governmental employee injury cases triggered the steering committee for our State employee safety program.

The contract construction industry in Wisconsin has been accounting for about $16 out of every $100 of indemnity and medical aid paid in compensable cases settled under the Workmen's Compensation Act of Wisconsin. More than 36 disabling work injuries occurred in construction during each 1 million man-hours worked in 1961 and 1962. The basic workmen's compensation manual premium rate on logging jobs went from $13.15 per $100 in wages in 1960 to $17.10 in 1961. Here the frequency rate has ranged between 81 and 119 during 1960–62. Work-connected injuries of over 1,200 State governmental employees in Wisconsin cost the State of Wisconsin more than a quarter of a million dollars in indemnity, medical aid, and other benefits in 1962.

In the summer of 1963, our statistical division mailed self-appraisal information developed by the construction safety committee to about 6,000 contractors, preceded by letters to more than 300 labor and contractor organizations.

5. The idea of working through trade associations is not a new one. The Industrial Commission and the Wisconsin Council of Safety are working with an increasing number of trade associations. This seems to be an exceptionally good way to reach the largest possible number of employers. The Wisconsin Council of Safety has recently set up a steering committee for trade associations as a division of its industrial safety steering committee. If an association desires to start a safety

program, the Wisconsin Council of Safety arranges for a safety institute. Our statistical division then prepares and presents a special study of the accident problems and costs in this particular trade group. Our special reports cover a wide variety of injury data. These reports include graphs, charts, tables, maps, "corny" drawings, and textual material in the nature of work injury highlights.

6. The University of Wisconsin also uses our data. The school for workers, which is a part of the extension division of the university, is very concerned about work injuries. Our basic data were made available to the university for various studies, including a special study of work injuries that have occurred in several hundred occupational classifications. Data on fatal and permanent disability cases will be compiled for a number of past years. Many labor unions have made the mistake of disregarding work injuries. The school for workers is trying to alert the unions to this fact. We also prepare special reports for industrial safety management institutes conducted by the university extension.

We are very fortunate in Wisconsin, because the leadership in our Commission and in the Wisconsin Council of Safety appreciates the value of statistics in planning for accident prevention work and using the data for delivering messages on safety. In a recent talk on accident prevention, Chairman Schimenz said, "Nothing of consequence can long be maintained without good records."

The individual employee is, of course, the key in the field of safety. However, it seems to me that our statistics will amount to something only if the message they carry can somehow or other be delivered to the persons responsible for safety, so that they, in turn, can be inspired to educate and train the individual employee effectively. Then, and only then, will our intelligence reports—our injury statistical data—fulfill their mission.

We do not intend to sit back and rely on what we are doing at the present time. The war on industrial death, injury, and disease will never end. However, we look forward with confidence to the time when the suffering and economic loss to the injured employee and his family, as well as the economic loss to the employer and State of Wisconsin, will be reduced to a respectable minimum.

The Records Program of a Large Company

George F. Nuernberger, *Superintendent of Safety, Fontana Works, Kaiser Steel Corp.*

Probability—the likelihood of the occurrence of any particular form of an event estimated as the ratio of the number of ways in which

that form might occur to the whole number of ways in which the event might occur in any form. On this basis we justify the time, effort, and expense of our accident record system.

Safety records, sufficiently detailed and analyzed, give life blood to our accident prevention efforts and contribute to the proficiency of accident control.

In the time allotted, I will give a visual and word description of our record system, show the end use, and the results achieved. It will be necessary for me to limit details, but I shall attempt to give sufficient description to establish a basis of understanding.

The bulk of information used to direct the accident-prevention program comes from the collection of injury and accident data arising from in-plant situations, out of which someone has suffered injury, no matter how slight. Those situations of accidents that do not result in injury, at present, do not significantly figure in our record system. This is due primarily to the fact that we have not devised an efficient and practical way of collecting this data. We do, however, collect data on all noninjury producing accident situations that are dramatic.

We have a procedure for reporting unsafe practice and unsafe condition situations. They generate from the safety efforts of individual hourly, salary, or supervisory employees. Records of these reports are maintained. Analyses of these reports have proved fruitful in appraising the accident control efforts and safety attitude of various segments of our plant population as well as appraisal of individual area environmental conditions. We have not used the information in this procedure to the optimum; however, in time we expect to expand our analysis of these reports. We believe further analyses will uncover and define weakness in our accident control efforts that, if left unchallenged, would ultimately result in injury or equipment damage producing accidents.

As I said before, recorded information about the individual incident that produces injury is the foundation of our entire accident prevention and control records. The information is made up of pertinent identifiable details such as date of injury, day of week, time of day, shift, age, department, occupation, etc. The type of injury, the body member injured, and the degree of injury, plus sufficient narrative account of the incident's occurrence is also recorded in a form so that a suitable analysis can be made to identify accident causes (including contributing environmental conditions and/or job acts or practices). The information on this report is prepared by the foreman and medical treatment personnel for every injury no matter how slight.

It is collected daily and a composite report is put together daily. The executive operating committee of the plant meets daily and one of the items on its daily agenda is a review of this report. Sufficient details are placed on this report to alert the executive management to the need for orders and action when unusual situations occur as well as when trends begin to establish themselves demanding action.

The area safety supervisor analyzes the completed report daily; first from the standpoint as to whether or not, in his professional opinion, suitable corrective action has been or is planned to be taken to prevent recurrence; second, how this incident relates, with his knowledge of similar occurrences, to the trend established in his area of responsibility. Finally, he analyzes for the causes of the situation and classifies them into previously defined categories for the purpose of contributing to the accident history of the operation.

Monthly, certain injury statistics and safety information are tabulated and reported in a composite manner to the entire supervisory organization of the company. This is for the purpose of furnishing periodic appraisal of their proficiency in accident prevention and control in relationship to their own previously established efforts and their relationship to others within the same plant environment.

Semiannually, all details of the injury and accident report are summarily tabulated and the data analyzed for the purpose of defining weaknesses in the accident control efforts.

Primarily, the following questions are posed and the answers are developed on specific department experiences: Where did the accidents happen? Part of the body injured most? What occupations had the most injuries? What day of the week? Shift? Foremen who had greatest number of injuries in their work areas? What were principal causes? Length of service? Time on job?

If, in the analysis of the data, out of the ordinary details show in significant amounts, every effort is made to develop a word description which defines the problem. It is then presented to the operating supervision who have the knowledge, responsibility, and authority to incorporate into the production practices the necessary safeguards to bring this malfunctioning under control. The channel to the individual employee is that which not only influences his environment and job procedure but his personal obligation to himself.

We consider that one of the prime functions of staff safety personnel is to evaluate hazards, judge the critical nature of the need for action, and on this basis, bring about positive action of operating personnel to establish accident-free work environmental conditions and practices.

The International Exchange of Statistics on Occupational Accidents

Henri P. Lacroix, *Assistant Chief, Division of Statistics, International Labour Office, Geneva, Switzerland*

The supplying of any type of statistical data by establishments to administrations is often considered as a fruitless, time-consuming task and its usefulness is often doubted.

Fortunately, the usefulness of the collection of statistics on occupational accidents is more immediately evident to employers and workers: everybody realises that such data are necessary if one is to understand where, how, and why accidents do happen, and how much they cost in lost productive time.

It may not always be conceived, however, by the contributor of the data to what extent the information assembled by government agencies on occupational accidents is actually used.

Data on accidents reported by American employers to various authorities are not only used in America. For instance, they are also forwarded to the International Labour Office, an international agency of the family of United Nations organisations, which has among its responsibilities the collection, analysis, publication, and standardisation of labour statistics. This organisation disseminates the data throughout the world, together with similar data from other countries, in its annual publication, the *Year Book of Labour Statistics*. To this effect the ILO assembles annually from countries in all parts of the world data on frequency rates of occupational accidents in mining and quarrying, in manufacturing, and in railways. Such data are useful, in particular, in underdeveloped countries which lack a system of collection of data on occupational accidents. They help them in obtaining an indication of the hazards of industry; they show the possibility of reducing occupational accidents' occurrence; and they can serve as a basis for establishing a first rough estimate of the cost of nationwide insurance plans against accidents.

The 1963 *Year Book of Labour Statistics* thus reports frequency rates for industrial accidents for 49 countries, covering all industrialised countries of the world, and some 27 less developed countries.

The figures show clearly that in the last 30 years fatal injury rates have decreased in the large majority of countries for which data are available, except during the Second World War, where a temporary rise in fatal injury rates was observed everywhere. It can also be seen from these figures that the ranking of branches of activity as to their danger is the same in most countries as in the United States; i.e., fatal injury rates are much lower in manufacturing than in railways and

are less still in these two branches than in coal mining. This is not a surprise, and major mining disasters repeatedly remind the world that a miner still has one of the most dangerous occupations despite technical progress and continued efforts to improve accident prevention.

One would wish to draw other types of conclusions from such a wealth of data. It would be interesting, for instance, to be able to rank countries according to the frequency of accidents in their manufacturing industries. Unfortunately, while the figures available do indicate magnitudes of the frequency of accidents in the various branches of economic activity, there are too many differences in the definitions on which the data produced in the different countries are based, and in their scope, to make it possible to come to such definite conclusions. It might be worth developing this last point.

Without entering into the fine points according to which an accident considered as fatal in one country may be deemed non-fatal in another, it should be noted that in some countries all injuries entailing medical or pharmaceutical care are counted as accidents even if disability does not outlast the day of the accident, while in other countries (of which one is the United States) only accidents resulting in an injury which prevents the victim from resuming work on the day following the accident are included. But in some other countries, the accident must result in 3, 4 (United Kingdom) or as many as 7 days of disability before it can be included in the statistics. Such differences, which take into account the severity of the injury to decide whether or not it should be included in the statistics, may result in exclusions from the data of one country of one-quarter to one-half of the injuries that would be included in the data of another country using a more comprehensive definition.

Other differences of definition can have still more influence on the statistics. Thus, most countries exclude accidents occurring on the way to and from work from their statistics of occupational injuries, as is generally the case in the United States: but several countries include such accidents in their statistics and do not always indicate them separately. When account is taken of the tremendous increase in the number of accidents on the way to and from work in the last 20 years (in France, for instance, almost as many workers are killed, in a year, on the way to and from work as during their work), it is not surprising that data including such accidents would not be at all comparable with data excluding them. Neither can it be considered as necessarily unwise to cover such accidents in the statistics (although they should of course be shown separately) because of their numerical

importance and since the insurance systems of about 30 countries in the world provide the same compensation for injuries sustained on the way to and from work as they do for injuries incurred on the job.

The lack of comparability of occupational accident statistics between countries has many other causes, most of which (as for differences in definition) pertain to the particular characteristics of the economic, social, and institutional setup of each country. Such difficulties are, of course, not confined to accident statistics. It is one of the roles of international organisations to help the various countries of the world to achieve better comparability in their data. The ILO started work in this particular field of international standardisation of occupational accidents soon after its inception, and a report on the subject was submitted to the First International Conference of Labour Statisticians, which met in Geneva (Switzerland) in 1923. A few years ago, the ILO prepared a detailed report on the scope, the definitions, the methods of collection, and the classifications of statistics of occupational accidents for review by a Committee of Experts on Statistics of Industrial Injuries, which met in Geneva, in November 1959, and was composed of nine experts of international reputation, including Mr. F. S. McElroy, Chief of the Division of Industrial Hazards of the U.S. Department of Labor's Bureau of Labor Statistics.

The conclusions of this Committee of Experts were submitted later on for the approval of the Tenth International Conference of Labour Statisticians, which met in Geneva, in October 1962, and brought together labour statisticians from 45 countries. The Conference adopted, unanimously, an international resolution covering terminology, definitions and classifications of statistics of employment injuries. This resolution forms, for the present, the basis of the international standardisation of accident statistics, and countries are repeatedly invited, through the recommendation of other international conferences, on the occasion of the collection of data on accidents, etc., to implement these standards. Also, a developing country which plans to start a system for collecting statistics of occupational accidents will normally ask the ILO for advice, and the ILO will put at its disposal this basic resolution, together with any other information on methods followed in countries which have comprehensive systems of accident statistics. As the international recommendations are based essentially on best national practices, such as those of the United States (although international standards are as yet definitely less elaborate and advanced than those of this country), it is clear that experience in the field of accident records in industrialised countries is directly benefiting the underdeveloped countries. In addition, the examples set by countries collecting data on occupational accidents and the request

by ILO for similar data from the other countries are incentives to countries which do not have such data to start assembling them.

The international exchange of information can also serve to disseminate throughout the world the results of a particular experience conducted in a given country. As just one example, an article on industrial injury trends over three decades, published in the March 1961 issue of the International Labour Review, reported inter alia, the results of a special campaign against accidents in railways, carried out in Belgium. On the basis of a detailed statistical analysis of injuries occurring in railways designed to determine the most common causes, locations, and circumstances of these accidents, the accident prevention department of Belgium undertook a safety campaign in 1953. The results were conclusive: in 5 years, the number of industrial injuries in railways decreased by nearly 80 percent and the number of days lost owing to temporary incapacity dropped by more than 60 percent. The influence of the massive introduction of safety apparel was made obvious through statistical analysis reproduced in impressive charts, such as one showing the decreasing rates of foot and toe injuries which declined by 70 percent during a period when the number of pairs of protective boots worn grew from less than a thousand to more than 40,000.

Considerable progress remains to be made, however, in the transmittal of the experience of industrialised countries in the field of occupational accident statistics to countries which are at the first stages of industrial development. Before such progress can take place, it will be necessary to improve first the adoption by all developed countries of higher statistical standards than are actually followed, and also to obtain a better international standardisation of statistical methods in this field than has yet been reached. Two examples may be given of the difficulties still encountered in this respect:

a. At the present time, only a few countries in the world have recognised the basic principle that a correct analysis of the causal factors of accidents must be based on a series of classifications of these factors (for instance, according to the agency, the agency part, the unsafe mechanical or physical condition, the type of accident, the unsafe act, and the unsafe personal factor, as recommended by the American Standards Association) instead of on a single classification. Most countries still use a single classification of accidents by "causes" which is generally short and fails to identify the various factors which are at the origin of an accident.

The international confrontation of methods of collection and of results of the classification of data on occupational accidents will help to convince the makers of such statistics of the necessity to develop

more detailed classifications than they have been using heretofore, so as to identify the various factors explaining why accidents occur. Some progress was made in 1962 in this respect at the Tenth International Conference of Labour Statisticians, which did recommend in particular as an international standard that accidents be classified according to the type of accident and according to agency. But there is still a long way to go before more detailed classifications of occupational accidents are adopted on a worldwide basis, especially as concerns classifications according to unsafe conditions, unsafe acts, or unsafe personal factors, which seem to be essential in the explanation of accident occurrence.

b. To be meaningful, comparisons from one country to another of the incidence of occupational accidents should not be confined to frequency rates, but should also cover severity rates; that is, measures of the time lost as a result of accidents. At present, few countries in the world compute such severity rates, but even for those countries, comparisons are very difficult because of the diversity of methods used to calculate the number of days considered lost in the event of death, of total, or of partial permanent disability. For example, the coefficient of loss for one finger is higher in one country than that for four fingers in other countries; the number of days considered lost as a result of the loss of one eye ranges from 1,100 to 4,600; the figure for total deafness in both ears varies from 3,000 to 6,000, etc.

In view of these differences, it has not been possible to establish an international recommendation in this field. Such standardisation will have to wait until an international scale of the number of working days lost as a result of permanent partial incapacity has been adopted, even if it is necessary to develop such a scale solely for the purpose of computing internationally comparable statistics.

WORKSHOP: CONSTRUCTION SAFETY—PATTERNS FOR ACTION

Moderator: W. Ray Rogers, *President, Associated General Contractors of America*

Introductory Statement by the Moderator

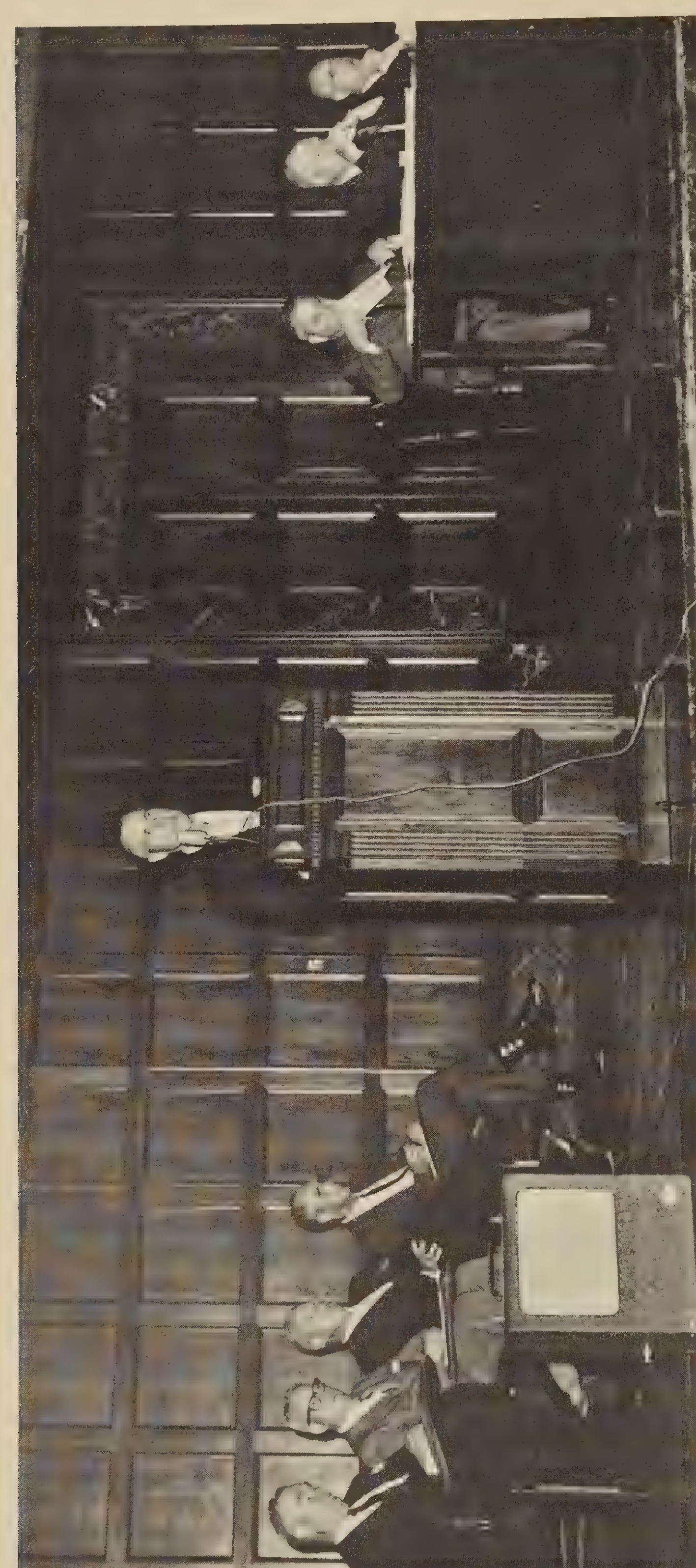
Distinguished panel members, ladies and gentlemen, it is a distinct honor and privilege to serve as your moderator today in this important phase of the President's Conference on Occupational Safety.

Construction is this Nation's largest industry, and has both the opportunity and obligation to maintain and promote a sound, practical safety program. The leaders of our industry must take the initiative, just as each contractor must make up his mind that he is going to take positive action to eliminate construction accidents. The decision must be made at the top of every firm and put into effect.

This determination was made for my company in this manner, and, upon my acceptance of the presidency of the A.G.C., I announced a like objective for the A.G.C. and its entire membership. I want *full* cooperation on behalf of all A.G.C. members in our safety program, and I expect 4,000 of our 7,530 members to be eligible for A.G.C. safety certification. In addition I expect 3,000 of the 4,000 eligible to be safety certified during my term at the helm.

The A.G.C. safety certification program criteria require the submission by all applicants of the following data:

1. Details of the company safety program.
2. Names of the individuals in charge of safety administration and jobsite safety.
3. A frequency of twenty (20) or less.
4. A copy of jobsite safety rules.
5. A statement by insurance carriers or other recognized agency that at the time the member's operations were reviewed, generally recognized safety practices and procedures as covered in the A.G.C. "Basic Outline and Operation of an Accident Prevention Program" were being followed.
6. Evidence of safety training for job foremen and superintendents.



A record number of delegates attended the workshop on construction safety. Appearing on the platform (l. to r.): Arthur A. Hansen, Hartford Accident and Indemnity Company; Brigadier General Henry J. Hoeffer, USA (Ret.), National Safety Council; Robert A. Wendell, U.S. Army Engineer Division, South Atlantic; J. F. Huntman, Employers Mutuals of Wausau; Joseph A. Courter, President, Courter and Company, Inc. (at lectern); W. Ray Rogers, President, Associated General Contractors of America; Ralph Olmstead, President, H. K. Ferguson Company; and Cornelius J. Haggerty, President, Building and Construction Trades Department, AFL–CIO.

7. Evidence of safety meetings for supervisors and craftsmen.
8. Statistical facts for inclusion in the A.G.C. disabling injury tabulation program.

All of the data are submitted over the signature of a firm official and verified by the secretary-manager of the A.G.C. chapter in which the company holds membership.

From what I have described, you may readily see that we are eliminating the element of chance from the evaluation of an individual firm's application for A.G.C. safety certification. Not only are the data required precise; the supporting statements from insurance carriers and those most closely associated with the safety program of the company must support all contentions.

We of A.G.C. hope more groups like ours will take advantage of similar programs to help improve the safety record of our industry.

Currently, the A.G.C. is in the process of putting the final touches to a safety training course for construction supervisors. The course is based on the A.G.C. Manual of Accident Prevention in Construction which since its inception in 1927 has been considered the guide for safe practices in the industry. A major publishing firm has been working closely with us to make the documents available not only to the A.G.C., its chapters and members, but to the industry as a whole. Again, we are working for the benefit of the entire industry. We have been assisted by the top men in safety for the Corps of Engineers, the Bureau of Reclamation, and the Bureau of Yards and Docks. Each of the awarding agencies has contributed valuable time from the inception in working with our staff, for which I am deeply appreciative.

Our safety knowledge is being actively supported by an ever-growing, solidly based, pyramid of practical safety tools and methods. We have and will continue to develop and put into practical use all of the safety means and know-how. Through the President's Conference on Occupational Safety, I am asking that we all close ranks to get the job done. It will take the efforts of all of us—labor, management, the Government, and the carriers—to bring safety to our jobs, to save lives and save money.

Safe Industrial Construction

Ralph Olmstead, *President, H. K. Ferguson Company, Cleveland, Ohio*

Each month, I have the pleasant duty of signing commendation certificates and checks for each of our superintendents or project managers who have conducted their work free of accidents in the preceding month.

Occasionally, I am requested to make an extra special award or citation. One of these occurred in 1960 at Idaho Falls on a job we were doing for the Atomic Energy Commission. A foreman named Carrol Rice was standing on the floor receiving tools which were being lowered from a 15-foot scaffold by a fellow electrician, Charles Parkinson. Mr. Parkinson suffered a convulsive seizure of some kind, and knowing that he would undoubtedly fall, Carrol Rice called for help and braced himself. Parkinson fell before help could arrive and Rice caught him, breaking his fall and probably saving his life. The man who fell weighed about 160 pounds and Carrol Rice weighs about 110 pounds soaking wet. Fortunately, neither man was injured; and it certainly seemed obvious that Carrol Rice had performed beyond the call of duty in carrying out the company's safety program. Later on he explained to me that it didn't occur to him that he might get hurt himself; he just didn't want to ruin the fine safety record the job had maintained.

Safety is often said to be an attitude of mind and if all our people were to develop Mr. Rice's attitude, we would either have a perfect safety record or a lot of flattened foremen.

The personnel of the H. K. Ferguson Company are proud of their safety record, both as an individual company and as a part of the National Constructors Association. Over the past 5 years our company has had an average frequency rate of 4.89, and an average severity rate of 722.52. For this rather unusual record, we would like to give considerable credit to the work of the National Constructors Association. The National Constructors Association was established in 1947, and its accident prevention committee was organized soon afterward with 14 charter members. The National Constructors Association is composed of general contractors who are engaged in both engineering and construction of industrial plants. I can assure you that the problems of accident prevention in modern industrial construction are just as great as those problems are in heavy construction anywhere in the world.

Modern industrial plant construction possesses a multitude of hazards which require constant study and the development of new techniques. Safety, as a management responsibility, has grown tremendously since the first construction job I had, where the greatest danger was the possibility of being kicked by a horse. Most people are much more likely to know the difference between the ends of a horse than they are the danger of atomic radiation, high voltage, or the hazards of vapors or fumes.

In order to try to keep up with this growing problem, the accident prevention committee of the National Constructors Association con-

ducts four workshops each year. Each of these workshops cover all of the facets of safety and they have set a quota for themselves of developing at least 4 suggestions at each meeting, or 16 per year, to be incorporated in the safety manual. Their safety manual is a dynamic and growing one with no completion date anticipated.

The accident prevention committee is composed of company safety managers and it serves as a continuous clearinghouse for studying the causes of accidents and developing programs for reducing their frequency and severity. I shall not attempt to cover them all, but here are a few of the things the NCA accident prevention committee has done to assist members in maintaining that attitude of mind contributory to safety.

First, it has a central file of safety engineers and nurses available for employment. Each company reports on all qualified nurses or safety engineers when their services are terminated and they are available for rehire. The committee issues a monthly report of frequency and severity rates to each member. The Association presents an Award of Honor annually to every company showing a better than average NCA record. And in 1963 a new award, the Award of Merit, was agreed upon to be presented for significant improvement.

The National Constructors Association issues a safety newsletter four times a year advising its members of unusual accidents and giving them the general story of accident experience. It also conducts regular accident prevention and insurance workshops. The Association provides its members with jobsite and safety program booklets and maintains a labor safety liaison committee, the purpose of which is to discuss and work out safety problems with the building and construction trades. These and the many other day-to-day activities of the NCA must be of value, because the overall safety record of NCA members has steadily improved over the past 10 years.

Probably the main value of the NCA program is helping to maintain that state of mind which will promote safety programs. In our own case, every individual in the Ferguson Company possesses, and is helped to maintain, that state of mind conducive to safety. They know from experience that a good safety record is as important to making a profit as any other single element involved in a job. I have heard that most of the money a businessman calls profit is merely the money that has not been wasted by his organization. This is probably only partly true, but on those construction jobs that don't make money, it seems abundantly true.

Statistics indicate that accidents cost this country about $14 billion per annum—and that is pure waste. If we could cut that figure in half it would mean $7 billion increased profits somewhere in the national

economy and my company, for one, wouldn't object to accepting a pro rata share.

No one will contend that accidents can be eliminated completely—at least not until those elements of human nature such as forgetfulness and occasional carelessness disappear—but certainly accidents can be drastically reduced. The activities of companies and associations certainly have been the major factor in reducing accidents in construction by about 60 percent since 1926. There is no logical reason why similar reductions cannot be achieved in the next few years.

The one way, in my opinion, to continue this progress is to emphasize more and more the role of general management in promoting safety programs. I suppose everyone has a slightly different concept of management. My own is that the chief executive of any company performs his function not in terms of what he can do himself but what he can do to influence others to carry out their work in functional balance and harmony. Each of us who has management responsibilities can spend a lot of time talking about our ideals, but when the annual meeting rolls around we are generally reminded pretty forcefully of the need to make a profit. In order to do so, I find that we have to achieve a balanced relationship and good communication among engineering, estimating, construction, labor relations, and safety as well as all of the housekeeping functions that modern business must maintain. If the top executive exhibits a lack of interest or, indeed, if he fails positively to emphasize any one of these key functions, his business will suffer, his earnings will decline.

Wholly aside from the humanitarian impulses which most Americans have in large measure, I am devoted to our safety program because it is one of the key elements in running successful, profitable and on time jobs.

When critical path scheduling was brought to the attention of the industry a few years ago, the H. K. Ferguson Company took the plunge along with many others and acquired a computer center, and on it we have scheduled nearly all of our work on what we have come to call our SPATS network. SPATS means sequence planning and time scheduling. We find that this type of scheduling is particularly useful in industrial construction, where there are hundreds or thousands of individual tasks to be performed as contrasted with the heavier type of construction which involves repetitive pours of concrete or repetitive operations of excavating equipment. The fact that we have found it necessary to schedule our work on the basis of individual operations has resulted in byproduct information on dangerous or hazardous operations. We have been able through this scheduling operation to emphasize required safety equipment and

protection on the very same basis as we emphasize the labor and material necessary to complete the work. I think it has been quite effective and I think anyone else who tries it will find that it adds a great deal to specific safety precautions as well as adequate communication between the office and field.

Finally, I would like to insert one word of caution—while emphasizing is required at all levels to achieve a safety program, it is only effective on the job itself and we cannot be at our best if either high levels of management or of government exercise too rigid control. There is just enough variation in local conditions and customs to make the strait jacket type of program partly ineffective in the field of safety management.

Last January we completed a job in joint venture with our parent company, The Morrison-Knudsen Company, which involved the design and construction of a 300-ton-a-day urea plant in Palembang, Sumatra for the Indonesian Republic. That job won a safety award for 2,219,000 man-hours of work without a single disabling injury. Most safety engineers would probably shudder at the thought of a work force of 1,800 men working barefoot on a heavy construction job. Yet, this was the case in Indonesia, and everyone associated with the job knows that if we had forced the men to wear shoes they would have been falling off the structure by the dozen. This is a simple illustration of the need to recognize local practices in the application of our own rules.

Harry Morrison, the founder of The Morrison-Knudsen Company, has developed during 50 years one of the great construction companies. He has always recognized that the company's greatest asset is its men. On the subject of safety, he puts it this way: "One man's safety is every man's concern."

Pattern for a Metropolitan Area Construction Safety Program

JOSEPH A. COURTER, *President, Courter and Company, Inc., New York, N.Y.*

I have been asked to present to you a description of the safety program that we successfully conceived and instituted in the city of New York and surrounding areas. I ask your forbearance in that it will be necessary for me to reach back and pinpoint beginnings and subsequent progression—leading to a coordinated program for construction job safety.

Convinced that safety was a challenge, and with an ever-growing interest in safety, I was eventually privileged to serve as a member of

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the Board of Directors of the Greater New York Safety Council, Inc.—a comprehensive safety organization serving the Greater New York area.

In 1960, the president of the Greater New York Safety Council formed a business and industry division. This group comprises some 20 members representing such areas as construction, utilities, insurance, and manufacturing. The men selected for this committee represent top management of major firms. Monthly meetings are held and various aspects of safety programing are discussed, with particular emphasis on assisting industry groups which show especially high loss records.

During one of these business and industry division meetings, Robert Hagopian, representing the Association of Casualty and Surety Companies at these meetings, stated that the construction industry was one of the worst offenders of safety practices. Bob, by the way, is the able Assistant Manager of their Accident Prevention Department.

It was agreed then and there that construction would be the first area for inauguration of a Safety Program—and so the seed was sowed!

Acting for the construction industry on this committee, I was urged to take over this task, together with Bob Hagopian. Bob and I met on several occasions to work out a program. After considering many plans, we decided to get this program on the road. We would hold the first Construction Safety Conference (in October of 1962), to be sponsored by the Greater New York Safety Council, Inc. and the Building Trades Employers' Association of the City of New York.

As a member of the Executive Committee of the Building Trades Employers' Association, I was in a position to affirmatively direct interest toward participation in this program. The executive committee received the suggestion favorably—and after due consideration offered to underwrite the major share of the costs involved. Word of this decision must have leaked out; for I was subsequently invited to speak on Construction Safety at the Fourth Labor-Management Conference, sponsored by the New York State School of Industrial and Labor Relations at Cornell University.

To digress for a moment: This Conference is unique—here management and labor under the direction of Cornell University have an opportunity to sit down and discuss mutual problems existing within the construction industry.

This presentation on Construction Safety was received with interest and enthusiasm and proved to be a further stepping stone toward the implementation of the Construction Safety Conference scheduled for October 10, 1962.

Peter Brennan, President of the Building and Construction Trades Council, and his associate representatives were so enthusiastic about the forthcoming Conference that they were prevailed upon to participate.

So our idea became a reality. The First Construction Safety Conference was sponsored by the Building Trades Employers' Association, Building and Construction Trades Council, and Greater New York Safety Council, Inc.

A powerful working group—Safety, Labor, Management—all inclusive! This was the nucleus, we believe that made the success of our program possible.

For the first conference, we came up with the following agenda:

Morning Session

Welcome by the President of the Greater New York Safety Council and the President of the Building Trades Employers' Association, followed by panel discussions on working programs for construction safety. Distinguished panelists and subjects were:

AM I MY BROTHER'S KEEPER
Edward J. Sullivan, Controller,
Turner Construction Co.

THE IMPORTANCE OF SAFETY TO LABOR
Peter J. Brennan, President,
Building and Construction Trades Council

SAFETY PROGRAM OF THE A.G.C.
Arthur Schmuhl, Director of Safety and Training,
Associated General Contractors of America, Inc.

CONSTRUCTION SAFETY AND THE INSURANCE INDUSTRY
Donald G. Vaughan, Assistant Vice President,
Aetna Casualty and Surety Co.

THE NATIONAL PICTURE OF CONSTRUCTION SAFETY
Henry J. Hoeffer, Assistant General Manager,
National Safety Council, Inc.

At noon, the Honorable Paul R. Screvane, President of the City Council of New York City, honored us with a speech, Construction Safety and the City of New York.

Afternoon Session

The afternoon was devoted to workshop sessions with competent moderators handling groups of 12 to 20. Four workshop sessions were held, with discussions on the following subjects:

1. What can contractors do to improve employee safety?

2. What are the safety techniques to reduce public liability hazards?
3. What can insurance companies do to assist construction safety programs?
4. Where to go for safety know-how and assistance.

Finally, we held a session summarizing the highlights of discussions held at each of the workshops. These reports were printed and distributed to all who attended the Construction Safety Conference.

The program proved contagious! Programs have been developed in other areas of the country. To date, construction safety programs have been held in the following cities: (1) Metropolitan Boston, Mass., (2) St. Louis, Mo., (3) Chicago, Ill., (4) San Francisco, Calif., (5) Portland, Maine.

We have been informed that other conferences are being organized, or are under study, in the following areas: Pittsburgh and Philadelphia, Pa., Baltimore, Md., and the State of Michigan.

Undoubtedly, there have been other conferences held about which we have not heard. We certainly hope so!

The most important outcome of our first construction safety conference was the formation of a safety committee, operating under the joint auspices of the Building and Construction Trades Council and the Building Trades Employers' Association. This group meets monthly. Representatives of the Insurance Carriers and the Greater New York Safety Council attend these meetings as consultants. Discussions cover a wide range of construction topics, such as the use of safety equipment, scaffolding, protection for openings—all items with which you and I are familiar—and a program is being developed which includes job visits for this group, a safety course to be included in apprenticeship training plans, and seminars for supervisory personnel, superintendents, and foremen.

The committee has visited scenes of accidents at jobsites—has made recommendations to contractors. Suggestions have been well received. Cooperation has been surprisingly good.

For the year 1963, we developed what proved to be a very successful poster program. These posters are issued bimonthly to over 1,000 contractors in the Greater New York area. These particular posters, which are strikingly designed and embody new concepts, are placed on jobsites and in other pertinent areas.

With the interest engendered by our first construction safety conference, we were encouraged to make plans for the second annual construction safety conference. This was held on October 2, 1963. Again, the response was enthusiastic. There was a substantial increase in attendance over that of the first conference.

An outline of the second conference follows:

Morning Session

The Presidents of the Greater New York Safety Council and the Building Trades Employers' Association, respectively, were once again the "Welcoming Committee" and the initial addresses and speakers were:

MANAGEMENT'S RESPONSIBILITY
William E. Dunn, Executive Director,
Associated General Contractors of America, Inc.
LABOR'S RESPONSIBILITY
Peter J. Brennan, President,
Building and Construction Trades Council

Workshop sessions were: (1) Responsibilities of general contractors and subcontractors for maintaining job safety; (2) How do you prevent falls? (3) How to get employees to use protective equipment; (4) Practical training techniques for safety on the job.

At noon, our guest speaker was the Honorable Malcolm Wilson, Lieutenant Governor of the State of New York. His theme: New York State's Interest in Construction Safety.

Our Third Annual Construction Safety Conference is now scheduled for October 14, 1964. We feel we are on the way toward making this a permanent event.

What are our immediate plans? They are:

1. A poster program representative of the respective trades, listing hazardous conditions within the trades proper, and how to avoid them. Some of these hazards are floor openings, unprotected shafts, lack of guardrails, and the removal of excess construction debris.

This program will take in such trades as plumbers, carpenters, electricians, bricklayers, ironworkers, excavation workers, plasterers, masons, and laborers.

2. We plan a meeting for our foremen for the purpose of reviewing our safety program. We are painfully aware that foremen do not always realize that *safety* is an inherent function of their jobs. Production-minded for years, they do not recognize well the important part they can play in *safety* productionwise, costwise, and, of course, there is the factor of reducing accidents with that valuable commodity—*human resources*.

3. We expect to employ a construction safety director at least on a part-time basis, and we hope to make it a full-time job, and make him responsible for the coordination of safety programs. He also will serve as a clearinghouse for reports on hazardous conditions at jobsites.

Results encourage us to believe that we are becoming more safety conscious—thus moving in a very positive direction.

However, this is a vast project, and one which is not easy to comprehend. We cannot depend on just a one-time injection. It is a job that requires constant attention—nurturing. It must be carefully watered. We must make the program real, understandable, and so subconsciously all-pervading, that the men we are trying to reach will absorb it readily through some form of osmosis not even realizing that it has become an important part of them.

This should naturally result in the automatic use of: hard hats, safety glasses, protective glasses, safety shoes, safe tools for mechanics, and other safety equipment.

Supervisory personnel must set an example by the use of safety equipment when visiting jobsites. We preach job safety and we *must* practice job safety. None of this "Don't do as I do—do as you are told."

We have become aware that *safety is everybody's business—both management's and labor's.*

We have done much—we must do more, much more—and we, of course, are here today because we are accepting the responsibility of safety. Now, what are our intermediate objectives?

We hope to—

1. Develop safety consciousness among employers and employees.
2. See that proper safety equipment is available for mechanics and is used.
3. See that supervisory personnel use and wear safety equipment when visiting jobsites.
4. Provide safe tools for mechanics.
5. Clarify the industrywide need for organized safety effort.
6. Encourage and promote development of an Organized Safety Program within each trade group, and then each firm.
7. Provide Posters, Signs, Rule Booklets—from a centralized source—such as the Building Industry Employers of New York State, the Building Trades Employers' Association, National Safety Council, Inc.; leaflets for mechanics; arrange meetings and lectures; and safety pictures.

Then, there are the long-range objectives—

1. Incorporate safety into all apprenticeship training programs.
2. Integrate safety training and retraining in all phases of the construction industry.
3. Start joint safety committees on each location, or for each job.

All this and more too, we hope, will result in a minimum of accidents, the easing of human suffering, and help in relieving undue hardship.

As implied before, this is not an easy task. It will take combined effort—the complete cooperation of management and labor—to reach our utopia.

We can summarize by stating we are proud of the progress made, but retrogression stands ever at the elbow, ready to take advantage should we allow laxness to prevail.

A safety program must be planned, and it is not just a management job. Insurance carriers and owners should be consulted—and persons responsible for implementing safety programs on jobsites should be clearly designated. There must be cooperation between general contractors, subcontractors, and labor. This is most essential. Education and communication must be maintained at all levels. All accidents and injuries should be investigated to benefit from past mistakes.

Just what are we trying to accomplish? We are trying to educate through a practical, planned and coordinated program the owner, the general contractor, the subcontractor, and the employee to recognize their respective responsibilities in providing safe working conditions at a jobsite.

I think we have made a beginning in New York, embarking on a program that has great potential for the cause of construction safety.

I think that the basis of our program could be followed in any other metropolitan area, regardless of size or other variables. I can assure you that we would be willing to give any other community the benefit of the lessons we have learned and are continuing to learn in New York City.

Again, this is a joint effort—Safety Is Everybody's Business!

Labor Puts Safety First

CORNELIUS J. HAGGERTY, *President, Building and Construction Trades Department, AFL–CIO*

As a representative of labor, I am happy to take part in this Ninth Biennial President's Conference on Occupational Safety because no single factor contributes more to the security of the average worker than effective protection against preventable accidents.

Insurance company policies describe certain types of accidents, somewhat irreverently, as "acts of God." When a catastrophe of that nature takes place, such as the recent earthquake in Alaska, the entire Nation is shocked and its machinery for relief and rehabilitation immediately is mobilized into action. This speaks well for the kindness and generosity of the American people, yet it betrays a blind spot in their perspective.

Why is it that public concern can so readily be concentrated on accidents that are wholly unpreventable? Why is it that we encounter, by contrast, such public apathy and disinterest in the face of accidents far more serious in terms of loss of life, injury, and property destruction which, for the most part, could have been prevented by planned safety programs?

I am speaking, of course, of industrial accidents—specifically those occurring in the construction industry. Last year construction accidents erased 2,500 human lives, resulted in 250,000 serious injuries, and cost almost a half billion dollars in aggregate damage. Yet the construction industry as a whole is going about its business this year as usual, with no broad innovations in accident prevention, just as though nothing had happened.

I think it is shocking that scarcely a bridge is built in our country over a river unstained with human blood; that the great power and navigation dams we keep constructing become mammoth mantraps; that modern skyscrapers and hotels cannot be erected without fatalities; that ordinary ditches and foundations cannot be dug without landslides that snuff out the lives of workers.

I think it is all the more shocking because something *could have been done* to avoid this gross waste of life and money, but was not; because something *can be* done to avoid a repetition of the shameful record this year, but *is not*. If anything, the record this year probably will be worse than in 1963.

Labor does not propose to let this condition go unexposed or uncorrected. We believe that the public must be aroused, the government must be alarmed, employers must be stung into cooperation, and that the trade unions must carry out their responsibility to their members and insist on *safety first*.

That is why we welcome this Conference. It provides evidence of increasing concern, at least among those most directly affected—the government, industry, labor, research foundations, and the medical profession.

Let me make labor's position crystal clear. We are not looking for credit. We are looking for results. We know we cannot carry on any effective safety program unilaterally. We are happy to share the responsibility, because we realize that is the only way to get results. With the proper encouragement from government, we are confident that management and labor, working together, can achieve tremendous progress in the field of safety for the mutual benefit of all concerned and without stepping on each other's toes. That, in itself, would be an accident fatal to any truly cooperative safety program.

I know that the attitude of some employers is that accidents primarily are caused by the carelessness or ineptitude of workers, that it is impossible to prevail upon workers to abide by safety rules and precautions, even when their own lives are involved. Such arguments do not impress me because they are not always based on fact. Machines break down and make mistakes, too, when proper precautions are not taken, when necessary upkeep and maintenance are neglected, and when speed at any cost is permitted to override common sense safety regulations.

The problem we face is not who is right or wrong, but how can we eradicate, or at least minimize, the consequences of any kind of preventable error, whether human or mechanical.

We say to the employer, you sit down with us and work out a good, workable safety program and we'll sell it to the workers. We believe that they will not only accept it, but willingly abide by it. The trouble is that in too many cases the employer himself tries to do the sales job and fails because his audience may suspect that he has other, hidden considerations in mind.

Another point that must be emphasized is illustrated by the policy followed right here in the Nation's Capital not too many years ago with regard to the constant flood of requests for the installation of new traffic lights at street intersections. Because of a limited budget, the authorities would agree to install such lights only after at least two deaths had occurred at any given intersection.

Unfortunately, many safety programs on construction projects also come too late. Builders and contractors hesitate to go to the expense of providing effective safeguards against foreseeable hazards unless compelled to by legal requirements or until after an accident takes place. Yet that accident may sometimes ruin the contractor or so delay his job that he loses his entire potential profit. Thus the first rule of safety should be that pennywise policies frequently are the most expensive.

My purpose here is not to lecture but to plead for cooperation. I am more than happy to concede that in recent years the construction industry has shown signs of progress. The simple requirement of wearing hard hats on the job has saved many lives and reduced the severity of accidents. Improvements in scaffolding have eliminated or lessened another prolific source of danger. For these and other constructive steps, we are delighted to give credit where it is due.

But the shocking accident figures that persist in construction make it plain that we still have a long way to go before we can even dream of taking a complacent attitude. Permit me to outline briefly, sev-

eral proposals, general and specific, which labor believes will lead to greater advances in safety.

1. The construction industry concededly is a hazardous industry, but on-the-job accidents are not acts of God. They can and they should be prevented. This will require, first of all, a new attitude on the part of both management and labor. The simplest way of expressing that attitude in concrete terms is this: safety is efficiency. A safety program is necessary to reduce the cost of the job in money and in human life. Here is a joint goal to achieve in which labor and management have a solemn obligation to work together. In the field of safety, neither labor nor management can be considered as transgressing upon the other's jurisdiction. They have a joint responsibility which must be jointly discharged.

2. Toward that end, it should be a must on projects employing any considerable number of workers to hold a pre-job conference on safety. This is no untried experiment. It has been tested in a number of cases and has proved helpful. The labor-management safety conference should include personal surveys of the terrain, the type of project and all anticipated accident potentials. A written safety program should then be drawn up, just as is required by the Army Corps of Engineers on every contract it awards. Putting the program on paper is not enough. Meetings must be held with the workers to give them full safety briefings in advance. Supervisors must be schooled in the safety requirements and held accountable for their enforcement. All of this means that safety should be regarded not merely as a laudable concept, but as a strict working guide and the first consideration at every step of the job.

3. The Government can be helpful by working with private research organizations to investigate the major causes of construction accidents and to devise practical methods for preventing their recurrence.

This is especially necessary in areas such as radiation, where only the government is in possession of all the facts. Speedy distribution of pertinent information to both labor and employers with urgent followups to seek compliance with indicated safety measures are part of the responsibility of government agencies at all levels, Federal, State, and local.

4. Every national and international union and every national contractor should engage the services of a competent safety engineering staff. They should conduct educational campaigns among workers, supervisors, and contractors alike. Only with wider knowledge coupled with greater determination can this problem eventually be overcome.

The trade union movement, from its inception, has focused its main energies on improving the working conditions of the wage earners of this country. Safety is the prime requisite for decent working conditions. The construction unions are determined to start a new and all-out war against preventable accidents. We welcome the leaders of industry as powerful allies in this good fight. It is a fight against evil, ignorance, human suffering, and needless waste. Undoubtedly, we will from time to time lose a battle, but given aggressive leadership and relentless effort, we can win this war.

Seymour Wolfbein, Director, Office of Manpower, Automation, and Training, U.S. Department of Labor (at lectern) discusses the implications of changing technology for training of people at plenary session on education. Other session participants seated (from left) are Dewey F. Barich, Detroit Institute of Technology; F. J. Konecny, Texas A & M University; R. E. Betterley, American Foundrymen's Society; Paul Hutchings, Metal Trades Department, AFL–CIO; and J. James Ashton, Delaware Safety Council.

MOBILIZING LEADERSHIP FOR SAFETY IN OCCUPATIONAL TRAINING

(*A Plenary Session*)

Presiding: DEWEY F. BARICH, *President, Detroit Institute of Technology*

Implications of Changing Technology for the Training of People

SEYMOUR L. WOLFBEIN, *Deputy Manpower Administrator and Director, Office of Manpower, Automation, and Training, U.S. Department of Labor*

Almost two decades have gone by since the end of World War II, and a retrospective look at postwar America over those years reveals three developments of particular pertinence to the subjects of our discussion this evening: technology, education, and safety.

I will, in brief and very summary fashion, describe the main elements of these three developments and point to some of the implications of each for the theme of this year's President's Conference on Occupational Safety.

I

The first development involves the days and years of our lives spent as members of the American labor force. The postwar period has witnessed a number of dramatic reversals in the very length of our working lives, particularly under the impact of a changing technology and the social and economic changes which have ensued.[1]

The fact of the matter is that for the first time since we have been keeping records on this subject, the length of working life among males *declined* during the decade 1950 to 1960.

It is important to note that over the long run, the length of working life among men has increased enormously during this century because of the advancing technology in medicine which has increased the male's expectation of life at birth from about 48 years in 1900 to 67 years in 1960. About half of these additional years of life went to an in-

[1] See *Changing Patterns of Working Life,* by Seymour L. Wolfbein. U.S. Department of Labor, Office of Manpower, Automation, and Training. August 1963.

crease in years spent outside the labor force—in growing up, in education, in retirement; the other half went to an increase in working life.

Over the long run, we therefore enjoyed the best of all worlds in this regard: We increased the time spent in growing up and being educated in the younger years; and we increased the time spent in retirement in the later years; and we still increased the time spent as workers in between, thanks to the great upturn in our life expectancy as a whole.

But the last decade saw an apparent end to that concurrence of events. During the 1950's, the continued increase in age of entry into the labor force under the impact of increasing time spent in education and the continued decline in labor market participation in the older years combined to outweigh the continued increase in life expectancy. As a result, work life expectancy went down for the first time among men.

At current rates, men are spending a quarter of a century—about 40 percent of their lives—outside the labor force altogether. In the 40-odd years of work they do put in, they must reap the dividends from their investments in education, support their family cycle, and provide the vantage point for their retirement.

The events of the 1950's I think, are a harbinger of more developments along the same lines for some time to come. Technological change is going to demand more educational preparation, is going to permit a shorter but an even more productive working life, and longer periods of so-called retirement.

At the minimum, it would seem to me, these events have the following implications for us all at this Conference:

We must improve the *quality* of our education. The growing number of years spent in education must yield diplomas which testify to knowledge gained, attitudes engendered, skill developed, responsibilities undertaken which are meaningfully perceived and correspond to the needs of an ever changing society under the impact of automation and technological advance.

That we are nowhere near that kind of achievement is shown by such phenomena as the generally lackluster vocational curricula at the secondary school level (responsible for the preponderant majority of dropouts in this country) or the incredible findings of our recent survey showing that 20 percent of the boys failing the Armed Forces Qualification Test (the equivalent of about a 7th grade education) are high school graduates.[2]

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[2] *One Third of a Nation.* A Report on Young Men Found Unqualified for Military Service. President's Task Force on Manpower Conservation. January 1, 1964.

We must—through more and better guidance and counseling at the elementary school level as well as in secondary schools, through more quality teaching personnel, through new, innovating curricula and methodology, especially with disadvantaged groups—make a really significant dent on the dropout problem. We are, right now, unfortunately making true the forecast that this decade will see a devastating total of 7½ million new young workers coming on the job market as high school dropouts.

We must make overt, specific efforts which will take into account the disadvantages under which our minority group population has been and is operating. The advantages of technological advance, of educational achievement, of improving safety on the job hold little enchantment for, say, the Negro teenage worker when the unemployment rate, at last reading, was 25 percent among the boys and an incredible 33 percent among the girls.

The additional years of education now being experienced by the American population should be used as a place and a time to instruct in both the attitudes to and substance of safety. Just as it is important to develop, in an evolutionary manner through the grades, attitudes, understandings and knowledge of the world of work as a whole, so it is critical to interlace into this development a corresponding course of events related to safety. My own feeling is that most of our current occupational information pays little or no attention to this important facet of the labor market. Yet, it is becoming even more important to make the years of our working lives freer of the interruptions engendered by such factors as industrial injuries.

We cannot leave this first section without reference to the fact that contrary to developments among the men, working life is increasing phenomenally among women.

During the same decade of the 1950's which saw such a dramatic reversal of events among males in the shape of an actual decline in their work life expectancies, the length of working life among females rose by an astonishing one-third. The equally dramatic reversal among women was the decline in the number of years they spend outside the labor force, so great was the increase in their worker rates during the 1950's. At current rates, women put in about half as many years working as do the men; at the turn of the century it was only one-third.

Perhaps the best way of underscoring these developments is to point out that the average high school girl today—despite the fact that she will marry and have a family—will put in 25 years of her remaining life as a worker.

All this is by way of reminding ourselves—and for some reason we do often need the reminder—that the implications we spelled out so far apply similarly to the distaff side of our manpower picture. In fact, in view of their increasing proportions of the American labor supply, special efforts in the area of safety education may be particularly relevant for the girls.

II

Concurrent with the developments we have summarized so far, have been overriding changes in the *pattern* of our working lives, particularly in the occupational and industrial deployment of the working population and the extensive mobility generated by a changing technology.

During the very postwar years we have been reviewing, two other historic changes have taken place. Both are well known and need only brief mention here. Around 1950, we found that for the first time in our history we had more people employed in the production of services than of all the tangible goods we use; and about 1957, the figures showed that for the first time in our history, we had more white-collar workers than blue-collar workers.

Cause and effect are well-nigh impossible to pinpoint in this field, but it is unquestionably true that these developments could never have transpired without a significant increase in technology. In fact, it is in the very goods-producing sectors, especially in manufacturing, in mining, and particularly in agriculture, that some of the biggest increases in output per man-hour have occurred. We simply can get out the goods we need with enormous productivity—both on and off the farm. Thus, the 7 million autos produced in 1963 were put out with 17 percent fewer workers than the 7 million car output of 1955; and we now actually can put out all of the food, feed, and fiber produced by the agricultural sector with only two-thirds of the workers we had in 1860.

At the same time, some of the trends we discussed in the first section which are generating more time for education and retirement activities are, in turn, generating substantial increases in the demand for personnel who can provide services associated with those activities, accentuating again the goods-producing to service-producing and blue-collar to white-collar shift in employment.

Since the educational prerequisites for employment in the fast growing service fields are, without exception, at the higher end of the spectrum, the implications of these trends are obvious. They do, in fact, underscore each of the implications already cited in our first section.

In terms of the safety dimension, my reading tells me that we still have a long way to go in providing adequate research which will provide hard intelligence and, in turn, pathways toward improvement of safety conditions in these growing white-collar, service fields. I will come back to this point later.

There has been another surpassingly important change in the pattern of our working lives highly relevant to the subject we are discussing. A detailed report on it has just been released by our office.[3] I refer to the increasing job mobility, the increasing amount of job changes an individual must experience in these days of rapid technological change. At current rates, a young man beginning his work career at age 20 will experience more than six job changes during the rest of his working life.

Even at age 40, a man can expect to make two job changes during the remainder of his work career; and even at age 50, the average male worker still has another job change to make.

This kind of pattern of career change underscores the importance of two additional implications of technological change for the educational fields.

We must provide through the educational system the broadest possible kind of endowment of skill, knowledge, and learning for every individual. *Change* is the password now and for the immediate years ahead under the impact of technological advance. Education must become the process which will enable the individual to withstand the inevitable changes which will occur in the relationships between what he learns and what he will be called upon to do in the world of work.

At the same time, the necessity of making a variety of job and career changes underlines the critical importance of providing persons beyond the formal phase of their education with a meaningful, up-to-date, responsive form of training and retraining opportunity. Postwar technological advance, the heavily disproportionate burden of unemployment on the uneducated and unskilled, the obsolescence of old skills, the creation of completely new fields—all warrant a very considerable effort in the training and retraining arena, not only by the Government under such legislation as the Manpower Development and Training Act but by labor and management, as some excellent efforts by unions and business enterprise already testify.

The implications for safety education and leadership are very similar. I would stress particularly the great advantage of safety education of the broadest kind, which can then be oriented to a specific job situation later on. The job mobility currently in force and fore-

[3] *Job Changing and Manpower Training,* Manpower Report No. 10, Office of Manpower, Automation, and Training, U.S. Department of Labor. June 1964.

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seeable for the years ahead demand a good, broad vantage point of safety education, both in attitude and principle as well as in substance.

III

The third development I want to call attention to is also a familiar one: the manpower profile of our country for the 1960's.[4]

The major pertinent items for our discussion here can be summarized very briefly. In the first place, 26 million new workers are coming upon the job market during this decade. In terms of workload for safety education, it has never been this high, particularly in terms of a brand new worker supply which has to get its first introduction to the firing line of the labor market. All this is by way of saying that in sheer numbers, we have never had this kind of problem, or if you will, this kind of opportunity.

This is not a development to which we can still look forward and leisurely plan for. Last year (1963) saw a million more 16-year-olds than the year prior as the high birth rates which began in 1947 began to provide potential workers. Age 16 is the legal age for dropping out of school, and 1963 saw the first impact of this development. Not surprisingly, 1963 also saw a postwar record in the unemployment rate for teenagers. The tidal wave is upon us and will be with us for a long time to come.

I believe, in view of this development, that we need the equivalent of a crash program to get an adequate core of safety education to the new millions coming upon the job market.

At the same time, getting leadership adequate for any kind of safety breakthrough is not going to be easy, because of another twist in the American manpower profile of the 1960's. In the midst of the cornucopia of young people, we are actually experiencing a decline—right now and for the rest of the decade—in people aged 35 to 45 years. The number of men and women in this age cohort will actually be lower in 1970 than in 1960, because a large proportion of these people were born in the 1930's and the birth rate was depressed in that depression decade.

Yes, this is the age group from which we must get our executive leadership and those interested in getting leadership in the safety effort from these people are going to find themselves in stiff competition from innumerable other demands for the efforts and talents of this sector of our population.

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[4] Detailed in *Manpower: Challenge of the 1960's*, U.S. Department of Labor, Washington, D.C. 1960.

IV

I would like now to finish with a few comments on the more direct impact of technological change on industrial safety. And I begin by stating that we are only at the beginnings of our knowledge of the relationships between automation and such features of workplace activity as safety. I, therefore, submit the following proposition to you without complete documentation; they represent my own readings of very preliminary returns on the subject.

The problem of industrial safety as we have known it over the years will continue to be a critical one in the industries and sectors we have watched so carefully over the years. This is by way of saying that such goods-producing industries as manufacturing, mining, agriculture, construction while perhaps growing less rapidly than some of the service-producing industries, will still be growing in the main, still remain important arenas for education and progress in the reduction of industrial hazards. We must not let the major thrust occurring in other sectors in any way detract from our efforts in these fields.

The growing service sectors include job fields in the relatively vulnerable fields such as laundries, retaurants, etc., in addition to the professional and managerial types we usually think of in this connection—and much further work needs to be done there, too.

In the years ahead, however, I think that automation and technological development are going to bring about major changes in the nature and conditions of industrial safety efforts. Technological change will move us strongly in the following directions:

Industrial safety will have to move more and more to a consideration of the nervous and mental stresses and strains and their impact on morbidity, absenteeism, etc. These, I think, will become relatively more of a problem than the more overt physical "accident" or event.

More and more attention will have to be paid to the effects of increasing pressures that come from the constant diagnostic and judgmental needs of jobs, the enormous responsibilities given to relatively very small groups for huge, costly equipment, the exacting tolerances required by new methodologies, new metals, new systems, the much more distant relationship between a man's efforts and the visible process or resulting product.

One of the greatest challenges we will face—in fact, are facing right now—is how to combine retraining with safety education (or perhaps more aptly put, safety guidance and counseling). I know of no better illustration of the meaningfulness of our topic today which emphasizes the connections among technology, education, and safety than the forces surrounding the retraining of people under the impact of automation—of the attitudes that have to be changed, of the responsibilities that have to be reassessed, of the self images of the job that have to

be adjusted, etc. Should anyone doubt the overriding importance of these forces which are going to apply to millions upon millions of workers, let him read the recent (April 1964) report of the events which transpired in the automating of part of a newspaper's activities [5] appearing in the *Journal of Occupational Medicine.*

Finally, I am of the opinion that we already have crossed the threshold of a problem in the field of education and safety which is really part of the overall problem we have in this country in the context of automation and technological change.

It was suggested recently by a psychologist on my staff, Dr. Lauren Wispe, who reflected on the causes of the tragic sequence of events in Baltimore, Md., recently when young people were killed and injured in exiting via an escalator from a stadium. As he pointed out, many of these automatic devices add to the ease of our lives when they operate; when they fail, significant danger ensues. "Is the 'social intelligence' available on the part of the public up to the 'technical know-how' implicit in these devices?" he asked.

It struck me that a good deal of so-called automation really puts the burden of operation on the consumer, the user of the product. An automatic elevator eliminates the man or woman to whom you can give the information and who can, in turn, operate the mechanism to your satisfaction; now you push the button or buttons for your floor, you have the option to press the "hold" or "open" button for an oncoming passenger or look the other way, etc. Some years ago, you picked up the receiver of a phone and got the services of an operator to connect you with your party; now you dial it yourself, and you had better know the 10 digits involved if you are making a long distance call.

As is true in the public arena, equipment now needs—and I think will require much more—safety devices of all sorts as well as attendants who will have some perception of how groups react to such devices. So it is true—and I think it will become more so all the time—that safety education in the workplace will have to be a much more sophisticated, psychologically based, problem-oriented operation under the impact of our advancing technology.

Guidelines for Cooperation in the School Community

NEAL DUNCAN, *Assistant Superintendent of Schools, Department of Vocational and Practical Education, Board of Education, Chicago, Ill.*

I can still hear the voice ringing in my ear that I heard from my earliest childhood days, "Put your tools back in their proper places

[5] "Automation: A Clinical Study," *Journal of Occupational Medicine,* April 1964, Vol. 6, pp. 169–173, by D. H. Goldstein and R. C. Hulsart.

when you are through" and "Clean up any litter you've made when you have finished." It was my father's voice, and much of my care today in regard to safety is due to what seemed to me then to be his ceaseless repetition of this advice.

For safety, ladies and gentlemen, is a mind set and a series of habits that must be inculcated in the individual from his earliest days. The basis for safety is laid in the home by the parents and must be reinforced and carried forward by the school community. If the family and the home does not do its share, then the burden on the school becomes correspondingly greater.

Safety in education begins the moment the child enters the elementary school and continues until his last day in the school system. It is important that the pupil observe every safety precaution, take every safety measure, and use every safety device at all times. No deviation should be permitted.

It takes eternal vigilance and everlasting persistence. The habits of correct practice for safety cannot be observed one day and disregarded the next. Even after the pupil knows all of the safety measures necessary, no laxity or slackness should be permitted. He must understand that he is not a self-responsible, self-reliant, and self-initiating person until he can be depended upon to practice all the rules and regulations of safe conduct and safe operation at all times—even when no one is observing him or checking on him.

Safety precautions normally are not natural reactions. They demand of the individual that he not follow his normal reflexes, not be in a hurry, watch carefully what he is doing, look ahead and consider the consequences of his actions, and that he be always alert.

The kindergarten child is taught on his first day in school not to run except in play areas because there is danger to himself and others in uncontrolled motion. He learns that certain procedures are necessary on the playground to avoid injury. He learns the procedures for firedrills and why they are necessary. He learns how to safely handle the equipment used in his room. He learns that there is an approved safe route which he must follow in coming to school.

The elementary child not only learns the rules and regulations for safety practices but the why of them, and helps to devise procedures to make sure these practices become automatic. Vigilance is necessary to insure no deviation or carelessness in execution.

The voice of authority can always give the answer—for the time being. However, it is impossible today to teach a child all of the concepts and principles that he will need in order to cope with the many potentially dangerous situations he will meet during his lifetime. Further, the world is moving ahead today so rapidly that those

"principles" he mastered yesterday may be all wrong for tomorrow's world.

Yesterday's admonitions on safe bike riding may be quite misleading in our modern suburbs of today. The old saying, "Don't play with matches," takes on a somewhat different meaning with today's pilot lights, electric stoves, and cigarette lighters. The seat belt may become obsolete with the coming of electronic highways and radar-controlled cars which we find described in the current literature of the day.

Today's child must learn to solve new problems, to think for himself. He must learn to analyze new situations within new contexts, to adapt or create rules of behavior for them, and to understand the necessity of adhering to these rules he has helped to make. Safety consciousness and the need for it must be developed in all possible ways.

The household mechanics shop or the industrial arts shop is usually the student's first introduction to shop work in the intermediate grades. The danger of injury is increased since many students will be working together in close proximity to each other. Time must be taken to develop an understanding and appreciation of the necessary safety precautions and to formulate the proper safety rules. Having assisted in the development of these rules, the pupils will be more apt to cooperate in their observance. But a word of warning! When children are given enough freedom to make really significant decisions about actual problems, they may not always select the solution the teacher had in mind. However, if the solution is reasonable they are much more apt to make it a part of their habitual procedure than if they had played no part in its determination. A safety organization should be developed through pupil participation that will insure a constant check against the use of unsafe practices by pupils. This might take the form of a rotating safety engineer who would daily note and report unsafe practices, following a checklist of duties devised by pupil committees.

The safety organization, however, is but supplemental to the essential program which is training more systematically in the habits of performance which will result in the safe execution of each specific job. The surest way to prevent accidents is to train students so that correct operations become automatic and the worker through habit and judgment obtains the greatest degree of safety.

Many safety devices have been invented for accident prevention, but they do not do away with the necessity for the continuous observance of safe practices in performance.

Each student at the beginning of his shop training should be systematically trained in the correct habits of performance and the safety habits which will make him a safe and desirable workman. No safety

or accident prevention program can attain maximum success unless it is conducted as an essential part of the teaching program.

To establish a habit of skill, the student must practice the procedure correctly from the start under careful supervision and drill without deviation in this procedure until the correct method has been so firmly established that it is automatic or semiautomatic. When that is accomplished, he has learned the correct way of doing the job just as a skater has learned the correct strokes or a pianist the correct notes.

The time to train a worker in correct operation and safe practices is when he starts to learn the procedures necessary to do any job. If he is not taught these from the beginning correctly, he will develop incorrect and unsafe habits which must be unlearned before the correct ones can be taught. This is much more time-consuming than if correct habits had been learned from the beginning.

The instructor must have a definite plan of procedure for the teaching of safety as he teaches the job procedures. The student must understand exactly what he is to learn to do. He must be taught how to do the work and why it should be done that way. He must practice the operation correctly from the beginning and never do it any other way. He must be watched constantly so that any fault in his procedure may be corrected. His work must be checked from time to time to determine his advancement and progress. He must work under supervision until he has mastered the process and the proper work habits have become fixed.

To develop correct habit formation, the instructor explains the correct process to the beginning student, shows him how to do it, and then lets him start the first step, watching to see that no wrong habit is being formed. The second step in the operation is not started until the first is mastered. Correct habits, which are safe habits, are taught in this manner for each successive step.

This is the most effective way to instruct in any manipulative skill: explanation, presentation, application, and evaluation, or "tell, show, do, and check."

A good instructor explains what is essential, then gives the student an opportunity to check his understanding by asking questions before the actual operation begins. This gets at the roots of the beginner's difficulties, and the student can be trained in habits which will make him a qualified worker.

No instructor can regard his student as properly trained until the worker has developed the skill and knowledge required for the operation of the processes inherent in the job, and has developed safety habits essential to the safe performance of the job.

Accidents are not only costly in time and materials but they can be dangerous or even fatal to the individual. In industry they result in higher production costs, poor quality of products, confusion, and loss of productive time. Industry clearly recognizes that production increases as workers learn to take care of themselves without close supervision. This not only reduces the hidden cost of materials, equipment, tools, and power which are involved in accidents but enables the foreman to give his time to other duties.

The instructor in the school shop should train his students so that they are acceptable workers who do not need long and costly instruction in safe practices before they can be profitably employed in industry.

Teaching safety in school shops is undoubtedly a most important part of occupational education. If students are taught from the first to employ safe work habits and why, they are much more apt to become safe workers in industry with a lessening of the accidents which cause such extensive loss of working time today.

Students must be taught to think continuously of the safe way of doing the job. Teaching must be checked to be sure that the student understands the correct and safe method of performing an operation before he is permitted to attempt it.

The large majority of school-shop accidents are caused by personal factors which are difficult to isolate and eliminate. Two-thirds of them are the results of unsafe practices such as chance taking, short cuts, disobeying rules, carelessness, working without supervision, failure to keep attention on the work, and being in too great haste. Students must be impressed with commonsense behavior in workshops. Horseplay, inattention, and talking to students who are operating machines are dangerous practices and cause many accidents. Yet, often examples of such unsafe practices can be seen as one walks into shops. A boy can be found grinding without using safety goggles or using a power saw without the use of the guard. Incidentally, this means that both teachers and supervisors should get around the shops more and be ever alert for any unsafe practices on the part of pupils.

The smaller remainder of the accidents in the school shop are caused by physical or environmental deficiencies. Poor housekeeping, insufficient guarding, defective equipment, improper working conditions, and improper dress cause most of these accidents. Good planning and organization can prevent a large share of them.

Shop talks on accidents and accident prevention, posters showing the results of accidents, posters illustrating the effects of carelessness, descriptive and illustrative pamphlets, competition and contests between groups, and printed safety rules have all proven desirable and

helpful. However, they are auxiliary devices. These and mechanical guards and devices placed about machinery, lectures, the use of audio-visual aids, and printed rules and regulations tacked to the walls, will never substitute for intelligent and diligent precaution and procedure by the worker.

As women come to constitute a larger proportion of our working force, it becomes necessary that girls as well as boys become inculcated with the necessity of learning and observing safety practices in the shops and laboratories, especially in view of the many new materials being used today, many of strange chemical derivation, as well as different and unusual processes of which the worker has little understanding.

The health program in schools today with especial emphasis on the testing of hearing and vision and the correction of any deficiencies found is another facet in the promotion of occupational safety. Conditions which might render a worker prone to accident are discovered in time for correction or else the individual is enabled to avoid those occupations in which these deficiencies might render it unsafe for him to work.

Safety lessons given systematically to all pupils in the schools which stimulate discussion and thought in regard to the principles and practices of safety are still another way in which occupational safety is promoted. Such lessons lead youth to consider the various factors involved and ways in which they may promote greater safety for themselves and their fellows.

The school cannot do this task alone. We need the help of everyone in the community, of the individual parents, of civic and service organizations, of business, and of labor. Often, however, our technique leaves something to be desired in securing this cooperation. Where this is so, we should ask ourselves the following questions:

1. Do each of the local civic organizations know of what we're doing? Does the P.T.A. know? Does the Kiwanis know? Did our students tell them?
2. Does the editor of the local paper know about our safety program?
3. Are the parents of prospective students informed about what we are trying to do—through letters, speeches, consultations?
4. Is local government aware of our program and of ways in which it can help?
5. Is there a planned program for keeping the community continuously aware of what our schools are doing?
6. Does our teaching staff really know what we are doing?
7. Does labor and industry know what our program is? Do we use their help to keep it up to date and to promote it?

In our total safety education programs we must look for the cumulative effect over the longer period of time. Safety practices must constantly be used as education. The school patrol, playground clean-ups, play area safety committees, all should be educative experiences. The same is true of safety practices in laboratory and shop. The long-time influence on personality, attitudes, appreciations, insights, and group living is part of the end result. Concern for the safety of others must be developed as well as concern for self. Constant endeavor and persistence will be effective; we must never relax our efforts. Rather, we must increase them.

ED. NOTE.—A panel discussion followed the two foregoing presentations. The question posed was: How can business, labor, and community groups assist the schools in developing safe workers? Participants were: F. J. Konecny, Texas A & M University; R. E. Betterley, American Foundrymen's Society; Paul Hutchings, Metal Trades Department, AFL–CIO; and J. James Ashton, Manager, Delaware Safety Council. See pages 30–31 for recommendations of the session, Mobilizing Leadership for Safety in Occupational Training.

WORKSHOP: PUBLIC EMPLOYEE SAFETY

Moderator: THOMAS J. McLERNON, *Assistant Director, Adult Education Services Division, National Education Association*

Accident Prevention Programing as Applied to Health Services

HASTY W. RIDDLE, *Executive Director, Kentucky Hospital Association*

The Hospital Association which I represent is a voluntary organization of the hospitals in the State of Kentucky. Our 130-member hospitals represent over 18,000 hospital beds or 98 percent of the beds in the State. Our association is supported primarily by dues of the membership and is not connected in any way with the State Government. The overall objective is to improve the hospitals and health care in Kentucky. Our central office operates with a staff consisting of the executive director, two stenographers, and one almost full-time bookkeeper and business manager. From this, you can see that our resources are modest and, of course, safety is only one of our many interests.

Although the overall topic title assigned to me is concerned with the broad subject of health services, I will confine my remarks to developing a hospital safety program in my State. The approach which we used to develop a safety program for hospitals in Kentucky may be applied to any of the other health services in which one might be interested.

As an organization, we have several specific interests in the subject of hospital safety. Many of our hospitals participate, for example, in the annual safety program of the American Hospital Association and the National Safety Council. Each year, these two organizations conduct a safety contest for the hospitals in the United States. Last

ED. NOTE.—This workshop was conducted as an "open end" type of discussion. Participants did not make formal presentations; instead, their comments were geared to elicit from the audience problems and contributions toward their solution. This type of presentation does not lend itself to verbatim reporting. Accordingly, for these proceedings, it is not possible to include other than a summary of major points raised and discussed (see Workshop Report included in Conference Report to the President, p. 31). Panelists were invited to submit items and backup materials which they desired to have included in these proceedings. The statements submitted appear in this section.

Thomas J. McLernon, National Education Association (at lectern) presides over workshop on public employee safety. Panelists who took part in the "open end" discussion are (l. to r.) Hasty W. Riddle, Kentucky Hospital Association; J. George Eichorn, International Association of Machinists, AFL–CIO; Franklin T. Gerlach, City of Portsmouth (Ohio); and Robert L. Moore, Lumbermens Mutual Casualty Company.

year, for example, two of our member hospitals had perfect safety records and were winners in the contest. Safety programs for individual hospitals have been carried out for many years by their insurance carriers in an attempt to keep insurance premiums at a low level. Also, we find safety programs in our governmental hospitals as a result of overall national programs of the Federal Government. Obviously, the programs in the voluntary hospitals vary to a great extent in both organization and effectiveness. Many people not familiar with the hospital field are surprised to learn that an average of nearly 1½ million persons are under care daily in over 7,000 hospitals in the United States. These hospitals are staffed with over 1,763,000 people not including the private staff physicians. From an industry-size standpoint, hospitals as a whole rank about the fifth largest in the country.

I am sure that most of you are familiar with the charitable immunity which eleemosynary institutions in this country have enjoyed for many years. In the past, the emphasis has been on the doctrines of charitable and governmental immunity rather than on the hospital's liability for negligently inflicted injuries. The charitable immunity doctrine first appeared in the United States in the case of *MacDonald* vs. *Massachusetts General Hospital*, a Massachusetts case in which it was held that a charitable hospital was not liable to a charity patient for the negligent treatment which he received. The court in the *MacDonald* case based its decision upon language in several earlier English cases. None of these English cases had, however, involved the court liability of charitable institutions such as hospitals. In addition, the case upon which the Massachusetts court placed its greatest reliance had been disavowed and overruled by later English cases. The Massachusetts court had been unaware of this, and many States have continued to recognize charitable immunity although they are now fully aware that the English courts had repudiated the doctrine before it was first applied in the United States.

Kentucky hospitals enjoyed charitable immunity until early 1961 when in a case, the Kentucky Court of Appeals departed from its previous line of authority and held that the charitable nature of an institution does not give immunity from liability from torts. The court stated that it would not distinguish between paying patients, nonpaying patients, and other persons who may be negligently injured. At the present time, 30 or more States have modified or completely done away with the doctrine of charitable immunity. The decision in the Kentucky case resulted in an immediate renewed interest by our association in safety in hospitals. Following this loss of charitable immunity, there was a rather significant rise in malpractice insurance premiums for hospitals in the State.

We had several conferences with the insurance commissioner and it was evident to us that in future rate hearings for increased premiums, it would be imperative that our member institutions and our association be able to present evidence that we have an active safety program and that it is showing some results. So far, the premiums have not increased, but it is inevitable that the carriers will ask for one in the future.

Another specific facet of our interest in safety has to do with our hospital licensure program, which is administered by the health department, and the involvement of the State fire marshal and the department of safety. These State agencies have on-going programs in which our hospitals are in some way inspected several times a year. The hospitals work closely with these agencies on the matter of safety and must do so in order to retain their license.

Development of a Cooperative Safety Program With State and Federal Government Agencies

As a result of the court decision referred to above in 1961, the Kentucky Hospital Association appointed a six-member safety committee. This committee embarked on a program which initially included safety bulletins distributed on a periodic basis to all of our member hospitals. The committee also conducted a mail survey of the number of institutions in the State having safety programs, and it was found that about 30 percent of the institutions had some type of program in effect.

In early 1962, we had our first contact with the Safety Division of the State Department of Labor. Carl H. Poetke, Safety Engineer of the U.S. Department of Labor's Chicago office, had been in contact with the Department concerning the development of some type of hospital safety program. Our conversations resulted in the development first, of a 3-day training program for the Department of Labor safety staff and fieldmen conducted by Mr. Poetke. Several of our representatives also attended the program. I might add here that the Department of Labor has field offices across the State but their field personnel were not primarily interested in safety as a specific work objective. Therefore, it was necessary to initially conduct a short training period for the fieldmen who would be making safety visits to the hospitals.

The U.S. Department of Labor and the State Department of Labor, in cooperation with our safety committee, developed a series of safety bulletins for distribution to the hospitals on a monthly basis. This series was designed with the how-to-do-it phases of initiating a hospital safety program. To date, 12 bulletins have been distributed. The material was designed in such a way that one specific subject could

be covered at each safety committee meeting in the hospital. Along with this series, the Kentucky Hospital Association Safety Committee designed explanatory safety bulletins to accompany or precede the bulletins being mailed from the State Department of Labor in Frankfort.

We felt that before launching a safety program or a series of safety bulletins for our member hospitals that it would be wise and almost necessary to have regional meetings to explain the program which we had designed. As a result, a series of four 1-day institutes for hospital personnel across the State were conducted. The faculty consisted of representatives of the Hospital Association, Department of Labor, Department of Health, Department of Public Safety, and the U.S. Department of Labor. These institutes were all completed during a 1-week period in four locations in Kentucky. We were very careful to include on the program in each location field personnel of the Department of Labor. These same field personnel would serve as safety inspectors, and it was felt that having them on the program would help not only in their training but would also expose them to the hospital people with whom they would be working. This turned out to be a rather successful venture. The institutes were designed to emphasize hospital safety and also serve to inform the hospital regarding the plan program. Our faculty traveled over 1,100 miles through the tortuous mountains of eastern Kentucky and the plains of western Kentucky within a period of 5 days. Without the excellent cooperation of all involved, we would not have been able to coordinate such an institute program in a relatively short time. I have copies of the material which we developed and would be happy to discuss it with anyone desiring to do so after the session. I would like to add that anyone desiring material at a future date can obtain the same by contacting my office or the Department of Labor in Frankfort, Ky.

Effectiveness of the Program

At the beginning of our planned program in August 1962, we knew that approximately 30 percent of our hospitals had safety programs of varying effectiveness. This information was obtained in a simple survey of the hospitals. We realize that in a paper survey it is very easy to say, "Yes, we have a Safety Program," and still not have a program which is really producing the desired results. In most instances in the hospital field, we find that those hospitals which are accredited by the Joint Commission on Accreditation of Hospitals have some type of safety program. This is almost a requirement for the accreditation of a hospital by the commission.

Twelve safety bulletins designed by the U.S. Department of Labor were distributed to the hospitals by our State department of labor. A part of the evaluation program was to have the safety inspectors visit each hospital in the State, beginning in October 1963, to determine the effectiveness of the program which we had designed. Between October 1963 and January 1964, the safety inspectors were able to survey 148 hospitals of the 162 total in the State. A very simple but concise questionnaire was designed for the safety consultant to complete after visiting the hospital. In addition to certain statistical data which the consultant obtained, he also obtained information on the types of safety hazards in the institutions and made specific recommendations for improvement.

The statewide survey revealed that of 148 hospitals visited, 82, or 55 percent, had safety programs. As far as we can determine, this probably represents an increase of 80 to 100 percent in the number of hospitals now having safety programs, compared with those having programs at the time we undertook our safety project. The total number of employees involved in the 148 hospitals amounted to 42,000—of which 5,500 were males and 36,500 were females. This is a rather startling ratio of male to female employees. We know that women workers now make up about 34 percent of the labor force in this country. Our ratio in the hospital survey should please the vice chairman of the Women's Conference, National Safety Council, who said, "I would be particularly interested in learning how women may make a contribution in the area of occupational safety." I am sure it would please the vice chairman to know that a woman, Mrs. Christine T. Haney, Supervisor, Safety Division, Kentucky Department of Labor, was primarily responsible for the development of the hospital safety program in Kentucky. With such a high number of female employees in our hospitals, it is obvious that the involvement of females in our safety program far overshadows that of the males.

I have a few statistics developed from the statewide survey mentioned above if anyone cares to hear them. We still have a great deal of data to obtain and analyze, such as types of injuries and so forth, before we can draw any meaningful conclusions on our program. (See Exhibit I, p. 217.)

Finally, I would like to say that our association has been involved in a cooperative effort with the Cornell crash injury program for the past 2 years. We have found from experience that cooperation with State and Federal agencies results in a well-designed and workable plan as far as hospital safety is concerned. One weakness in such programs is always the lack of constant attention and followup. This we have found as a necessity if the program is to be a success. As we

all know, the subject of safety is easy to forget and it seems that a lot of people want to forget it, when it involves a bit of work. A program which is worth anything must have a periodic analysis to determine not only what it has accomplished, but also to reevaluate the program in the light of the lessons learned and new developments in the field.

I have attempted not to bore you with the many details and the minutia of the development and implementation of our program in Kentucky. It has been a pleasure to participate on this panel, and I would be most happy to answer any questions which I am capable of discussing.

EXHIBIT I

Kentucky Hospital Safety Program

Total number of hospital checked	148
Total number of employees	42, 096
Total number of males	5, 547
Total number of females	36, 549
Total number of beds (including bassinets)	17, 232
Total number of accidents (last fiscal year)	2, 228
Total number of employee accidents	681
Total number of patient accidents	1, 462
Total number of visitor accidents	85
Number of hospitals having:	
Received material	141
Safety committee	75
Safety program	82
Made use of material	126
Safety committee meetings	70
Health program	132
Inspection made by consultant	116

Accident Prevention Programing as Applied to Public Works

Robert L. Moore, *Superintendent of Engineers, Lumbermens Mutual Casualty Company*

Accident prevention programing as applied to public works doesn't differ to any great extent from the accident prevention programing which the contractor does for any construction job he may perform for any private firm or individual. The responsibilities for organizing and coordinating the program are the same. The same responsibilities exist for supervision and training of workmen and supervision in safe attitudes and safe working procedures. Equipment maintenance, evaluation of the program, incentive awards, and observation of work methods are also substantially the same.

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The differences in operation begin with the fact that we have a supervising agency, as required by law, to act for the government. This means that government-type safety requirements must be followed as well as many other things outlined in the contract. Development of the program involves 3 steps: (1) submitting a safety program in advance; (2) finalizing the program at a preconstruction conference with government personnel; and (3) revising the program as needed as a result of periodic inspections by government personnel. In addition, accident reporting to the government agency is required as well as periodic surveys and analyses of reports by and to Government officials. Also, while the public must be protected in all construction, additional attention is required to the public on a public works project.

The government employee works under a government safety program quite similar to that of the contractor employee. The government employee participates in many more safety meetings, indoctrinations, inspections, reports, and training. Because real enforcement is possible, the Government employee accident figures have been lower than those of the contractor employee.

The contractor employee is well taken care of under the contractor safety program. That would vary, of course, with the degree of enforcement involved in following up the contractor program. As a matter of fact, isn't it true that the success or failure of any program depends upon the degree of enforcement?

The public citizen feels obliged to look in on the public works job a lot more than any other type of job because he feels that his money is involved. In any case, his safety must be considered much more in this type job.

Considering the broad general field of public works and the accident prevention programing that is necessary, let us first consider the basic needs for success:

A. Workable program needed.
B. Must have tailormade programs.
C. Clearinghouse on programs should be established.
D. More publicity on successful programs indicated.

So let us separately consider the problems mentioned at the outset, plus the many answers that various governmental agencies have given as their impression of satisfying the *basic needs.*

Municipal Employee Accident Control

Two years ago, in March 1962, the Honorable Anthony J. Celebrezze, then Mayor of Cleveland, set the theme for Stimulating Public Employee Safety. He stressed that "*Much Had Been Accomplished.*"

He said then that much remained to be done. This is still true today in spite of all of the good work done by such organizations as: U.S. Conference of Mayors, American Municipal Association, International City Managers Association, Municipal Finance Officers Association, American Public Works Association, Public Personnel Association, The National Institute of Governmental Purchasing, American Transit Association, American Water Works Association, AFL–CIO, American Public Power Association, Water Pollution Control Federation, and the Texas Municipal League.

Many of the organizations listed have satisfied the first two basic needs regarding program development, but there is still much to be accomplished in the area of publicizing these good efforts and recording them in a clearinghouse where such information would be available to others. Some is available now from various sources as is pointed out by the Texas Municipal League by saying "Want A Safety Program—Or Do You Need A Better One? Here's Help!" They do offer help of the clearinghouse type by giving factual information on organization and operation of a safety program. All one needs to do is write to Frank K. Beardslee, Chairman, Municipal Safety Advisory Committee, % Texas Municipal League, 402 Vaughn Building, Austin 1, Texas.

Other Clearinghouses for Information

1. American Public Works Association has recently set up a safety committee and will start a clearinghouse for safety programs. Their address is: 1313 E. 60th Street, Chicago, Ill., 60637.
2. National Safety Council has Public Employee Section and Construction Section.
   a. *Contractor's Outline for Accident Prevention.* This booklet outlines basics that are essential to a contractor's safety planning. It provides a sample general safety policy and a foundation for accident prevention programs.
   b. *The National Safety Congress Transactions* contain the jointly published talks given at both sections' Congress meetings. The closeness of these two operations within the National Safety Council framework is further emphasized by the joint meeting of the two sections when the Highway Division of the Construction Section and the Public Employee Section meet together.
3. One magazine, *Public Works*, reprints National Safety Congress talks in their monthly publication which is devoted to

city, county, and State public works problems. This type of additional publicity is what is needed to spread the word on effective safety programs.

4. The Office of Occupational Safety in the U.S. Department of Labor's Bureau of Labor Standards reported some time ago that of 1,728 municipalities with more than 10,000 employees, only 348 had started some sort of employee program, and only 43 had a safety officer. This office can also be considered as a clearinghouse for up-to-date information on present statistics on employee safety programs started and can be obtained by writing its office in Washington, D.C., 20210.

The Associated General Contractors of America, an organization of over 7,000 general contractors, deserves much credit for the development of their Basic Outline and Operation of an Accident Prevention Program, which certainly satisfies the basic needs of both the large as well as the medium- and small-size contractor. Many governmental agencies write into their contract specifications that the contractor must comply with the safety provisions as set up in the Manual of Accident Prevention in Construction of the AGC.

The AGC Safety Accreditation Program that has been newly developed has been built around this basic outline plus an accident frequency of 20 or under. In order for a contractor to be safety accredited, he must also show evidence of doing a job of training employees and the new training program of this association will fill another of the basic needs of the construction industry, which according to the latest figures available has a backlog of public works construction alone of $73,096,534,000 (*Engineering News-Record*, March 1964).

It has been reported that in the field of public works there will be more work-injury exposure during the period 1960–75. The U.S. Department of Labor predicts for this period a 37-percent increase in government employment, particularly at the State and local levels, and a 52-percent rise in construction employment. This certainly should point towards more activity in safety program development at the State and local levels.

Many of the governmental agencies have done remarkable jobs in the area of public employee safety and in contractor employee safety, but time and space will not permit the documentation of all the good jobs that are known; however, allow me to call attention to a few and let me also point out a few high points of each program.

1. The Corps of Engineers of the Department of the Army started their safety program in 1933 and expanded overseas in 1940. They

are now active in all 50 States and in 25 countries of the free world. Much progress has been made in the prevention of accidents to both employees of the government as well as to those of contractors. Take a look at the frequency and severity figures of both—the record speaks for itself:

Government Employees

Year	*Frequency*	*Severity*
1935	17. 42	3, 150
1942	8. 84	1, 240
1951	5. 42	910
1963	3. 29	520

Contractors' Employees

Year	*Frequency*	*Severity*
1935	111. 29	8, 710
1942	17. 61	2, 490
1951	12. 48	2, 180
1963	5. 52	2, 710

As an example of accomplishment, the Corps of Engineers should be recognized for the progress they made in accident reduction in one high hazard area in the field of construction operations. They tied in a yearlong campaign starting on April 1, 1963, with the National Safety Council's campaign for the prevention of falls. This success story can best be told by reproducing the April 1, 1963, announcement letter from their Chief of Engineers, which reads as follows:

"1. The Construction Section, National Safety Council, has recently announced a nationwide campaign for the prevention of falls on construction worksites. I endorse this campaign and desire that all elements of the Corps participate in it. In addition, I would like you to place special emphasis on preventing falls at all of our construction projects from now through fiscal year 1964. This should include education of workers as well as elimination of hazards. Our hired labor work safety record should be exemplary.

"2. Last year our work falls accounted for about one-third of all disabling injuries and 1 out of 13 of these resulted in a fatality. It is obvious that fall prevention is an important element of our safety program. While our safety procedures are adequate generally, it is suggested that we give more attention to the use of life nets, climbing devices and other measures which give good protection without encumbering the workman.

"3. With the cooperation of all concerned most falls, especially those which have fatal possibilities, can be prevented."

Only an accurate statistical reporting system could allow any governmental agency to tell of the results of such a yearlong safety program. The followup letter with the campaign results was dated April 21, 1964, and here is what the Chief of Engineers reported to those Corps of Engineers in the field:

"1. On 1 April 1963, I sent you a letter endorsing the subject campaign and asked that it be applied to all work of the Corps. I am gratified with the results to date compared with the preceding like period. Fatalities from falls have been reduced 58 percent and disabling injuries reduced 31 percent. Improved guarding of elevated work surfaces and the increased use of life nets were large factors in the gains made.

"2. Because falls have been such a large source of casualties in construction we still experienced 11 fatalities and 379 disabling injuries. It is demonstrated that continued emphasis on preventing falls, plus the momentum already generated, will bring these casualties under firm control.

"3. I desire that the campaign for the Prevention of Falls, as announced in my letter of 1 April 1963, be continued throughout fiscal year 1965."

This is certainly a record to be proud of! The General Safety Requirements of the Corps of Engineers EM 385–1–1, dated March 13, 1958, is not only written into contracts with sensible safety regulations written up as a manual, but it is also used as a guide for safety engineers on construction work other than that being done under the supervision of the Corps of Engineers.

2. The Bureau of Yards and Docks of the Department of the Navy started its safety program in 1955. Here is the record:

Contract Construction

Year	*Frequency*	*Severity*
1956	22. 72	2, 765
1961	12. 22	2, 083
1962	6. 78	1, 527
1963	7. 73	2, 706

All-Navy 1963 statistics showed a frequency rate of 3.25, with a severity rate of 324. They reported 0.87 motor vehicle accidents per 100,000 miles.

In the Public Works Centers, a frequency of 2.55 was reported, and a severity of 667 with a 0.41 motor vehicle accidents per 100,000 miles.

The Bureau of Yards and Docks has used some very productive public works gimmicks that have paid off from a safety standpoint:

Controlled Maintenance Program. Their controlled maintenance program is a management program, but it is tailormade for safety. Keeeping track of public works maintenance crews was always rough, but with the controlled maintenance program it is easy. The program is described in Navy film MN–8131–A titled, "Public Works and Public Utilities Controlled Maintenance." This film is available at the DPWO at Great Lakes Naval Training Station, Great Lakes, Ill., and in Navy film libraries.

Testing and Licensing of Construction Equipment Operators. Here is the newest gimmick which is a program of testing and licensing of construction equipment operators. The high point of this

program is film MN 9918 titled, "Testing and Licensing of Construction Equipment Operators," which will be shown at the 1964 National Safety Congress on October 28.

3. The Bureau of Public Roads started an organized safety program in 1957. Prior to that time, the program consisted of nothing more than an occasional mailing to the field on some safety subject, and periodic statistical reporting which proved to be unreliable.

A program suitable to the operations of the Bureau was first developed and finally published as one volume of their administrative manual. This volume is kept current and contains the policy, the procedures for carrying it out, and a considerable number of safe practices applicable to the type of work they do.

Most of their problems concern people working out of doors on survey and inspection work, so guarding machinery and the control of working conditions are not applicable. They rely on the individual supervisor to see that his men are properly instructed in the hazards and precautions of the job, and then to enforce safe working practices. Safety meetings are held regularly. Accidents are investigated and the information used for preventive purposes. Some work calls for better than average physical stamina and the personnel office is cooperating in selecting qualified people and also transferring those who turn out to be unqualified.

All employees who need to drive are screened and operator's permits are issued only to those who meet the qualifications and pass the road test.

An award program has been instituted which has furthered the acceptance of the safety program.

In 1957 the injury-frequency rate was 16 disabling injuries per million man-hours. Last year a rate of less than 7 was achieved. The motor-vehicle accident rate, after reaching a high of 9 accidents per million vehicle miles in 1958, is now under 5.

The program relating to contractors' employees is newer. Contract document requires that suitable safety precautions be taken and that contractors' accidents be reported to the Bureau. Copies of the AGC Manual of Safety in Construction have been distributed to the project engineers as a guide to safety on the job. Contractors are encouraged to participate in the AGC safety program. Some National Safety Council material such as posters, films, folders are used, and contractors are given a copy of "Contractor's Outline for Accident Prevention."

4. The Bureau of Reclamation initiated their present program in 1960 when increased emphasis was placed on health and safety in contract administration. They have *Safety Requirements for Con-*

struction by Contract, which is in its third edition, dated September 1962.

Their contractor accident frequency rate was 15.8 in 1963, which represented a 40-percent reduction when compared to the record in 1960.

The Bureau of Reclamation program is predicated on an integration of safety into management supervision at all levels of operation. They have a commissioner's "Annual Award," which is given to the region with the best safety record each year. Further recognition is given to honor an exemplary contractor's safety record with a "Contractor's Safety Award Certificate" signed by the commissioner, the chief engineer, and the construction engineer.

Contractors must submit a safety program for review and approval prior to the start of construction. They urge contractors to self-police their operations and encourage them to qualify in the new AGC safety certification program.

In the event that the Bureau fails to get voluntary cooperation and self-policing, they are prepared to take appropriate and necessary steps to insure compliance with their health and safety requirements. These steps are spelled out in the contract specifications and range from written orders to suspension of all or part of the work. While these actions may appear to be drastic and fortunately are occurring less and less frequently, they are essential if safety is to be considered on a par with quality of product.

The Bureau of Reclamation is also participating in the falls campaign of the National Safety Council.

5. The Tennessee Valley Authority was established in 1933. During that same year, a Director of Health was appointed, and in July 1937, a Health and Safety Department was created with its director reporting directly to the General Manager.

Awards.—The National Safety Council presented its second highest award, the Award of Merit, to the Division of Reservoir Properties for 1,273,814 man-hours of work from October 30, 1961, to December 31, 1962, without a disabling injury; to the Colbert Steam Plant Branch, Division of Construction, for outstanding improvements in frequency and severity rates in calendar year 1962; and to the Colbert Steam Plant, Division of Power Production, for operating 2,016,819 man-hours without a disabling injury from May 28, 1959, to April 30, 1963.

On-the-Job Accidents.—Both the frequency and severity of accidents in TVA in 1963 were lower than in 1962. The frequency rate of 6.28 accidents per million man-hours worked is 18 percent less than the 7.68 figure for fiscal year 1962. The severity rate of 1,765 days

lost per million man-hours worked is 33 percent lower than the 1962 rate of 2,641 per million man-hours.

The Office of Power experienced a 22-percent decrease in accident frequency, but its severity rate nearly doubled—primarily because of two fatalities in 1963, as compared with none in 1962. In the Division of Construction, there was no significant change in the frequency rate, but the severity rate showed improvement because the number of fatalities was three compared with four in 1962.

Vehicular Safety.—TVA's vehicular accident-frequency rate of 8.19 accidents per million miles driven is higher than for any year since 1952, and represents nearly a 40-percent increase over the 5.87 rate for fiscal year 1962, the second lowest rate in TVA history. Still, the 1963 rate is 28 percent under TVA's 30-year average rate of 11.44. For comparison, the latest rate for all types of motor vehicle fleets reporting to the National Safety Council is 13.02.

The highlights of their safety program include an outline of accident prevention program fundamentals, promotion planning, and weekly tool box meetings. Their safety program embraces the application of their accident prevention policy as an integral part of the work performance.

Their health program is a story of too great length to cover here, yet it is one which bears investigating by those interested.

6. The Department of Water Resources of the State of California represents a State organization with a big responsibility and a good safety program. The department's employee safety program was initiated in June 1959, and the program encompasses both vehicle and injury accident prevention for all employees. There have been no fatal accidents to employees since the department was originated in 1955.

Insurance Dividends.—Their insurance rebates for employee injury has more than paid for the office budget:

	Dividend (in percent)
1960–61	55.5
1961–62	30
1962–63	57

The earned premium averages $150,000 per year.

Their contractor program was initiated in February 1961 with the full support of the chief engineer and director. Their program is supported by a clause titled "Accident Prevention" in their contracts, which stresses compliance with safety orders of the State of California and covers the use of the Department of Water Resources Manual of Accident Prevention, which is to be used as a guide for accident pre-

vention by the engineer and the contractor. The contract clause further specifies that in the event of failure or refusal to take corrective action within the time specified shall constitute a failure on the part of the contractor to perform provisions of the contract, which can lead to suspension of work. Pre-job safety meetings enable both contractor and department officials to agree upon the contractor's safety program.

"Gimmicks" are used to emphasize importance of safety such as the inclusion on all drawings of the wording "SAFETY—As Necessary As Water," and the use of No Lost Time Accident Decal Awards For *Safe Workmen*, which are put on the workmen's hard hats.

Incentive Awards

Incentive awards have their place just as they have been found to be practical in private industry. Recently a general contractor doing work for the Atomic Energy Commission on a cost-plus-fixed-fee contract received AEC permission to give incentive awards after going a full year without a disabling injury, with nearly 700,000 accident-free man-hours during the period May 6, 1963, to May 6, 1964. Every fieldworker received a lunch bucket with a safety decal and every office-worker received a gallon thermos jug.

Off-the-Job Safety Programs Improve On-the-Job Safety Records

A New England contractor has shown much ingenuity and planning on a very comprehensive off-the-job safety program. He reminds his employees by signs that can be read when going into and out of the workplace exactly how the two programs are interrelated and how one takes over when the other leaves off:

OFF-THE-JOB SAFETY BEGINS HERE
ON-THE-JOB SAFETY BEGINS HERE

Many Cities and Counties Have Common Problems

Most cities and counties have the problem of developing safe methods for water-main construction and distribution. Several visual aids are available which will help in the local accident prevention problem:

One film has been produced by the Department of Water and Power of the city of Los Angeles. The film is in four parts:

Part I—Main Line, Trucks and Barricades.
Part II—Shoring and Bracing.
Part III—Pipe Installation.
Part IV—Odds and Ends.

Copies of this film can be obtained from:

Department of Water and Power,
City of Los Angeles,
207 South Broadway,
Box 3669 Terminal Annex,
Los Angeles 54, Calif.

Another film titled "Warn, Guide and Protect" treats of the problems associated with work being performed on streets and highways, such as trenching, etc., while vehicular traffic is underway. This is a very good film for training purposes and it can be obtained from:

American Gas Association,
420 Lexington Avenue,
New York 17, N.Y.

Far too many workmen are killed or injured in trench cave-in type accidents. Recently, the Associated General Contractors of America has bound, under one cover, a series of seven articles reprinted from their official magazine *The Constructor*. This series is titled "Safety in Trenching and Excavation" and is available at 50 cents per copy with a 20-percent discount on orders of 10. Further discounts are available on greater quantities upon request to:

The Associated General Contractors of America,
The Constructor Rapid Reader Service,
1957 E Street NW.,
Washington, D.C. 20006.

Work Injuries in Road Construction

The Bureau of Labor Statistics has completed its survey of work injuries and work-injury rates in highway and street construction. The final report of that survey contains an estimate of the cost of work injuries in the industry and detailed analyses of:

1. Injury rates by—
   a. Kind of construction.
   b. Type of operation.
   c. Geographic areas and States.
   d. Size of establishment.
   e. Occupation.
2. Nature of injuries and parts of body affected.

This report may be obtained free of charge by writing to the Bureau of Labor Statistics, U.S. Department of Labor, Washington, D.C., 20210. This report surveyed 3,359 contractors with 62,000 workers. The average disability lost time amounted to 172 days. During 1961, 1 out of every 22 workers in the highway and street construction industry suffered a disabling injury.

Conclusion

In conclusion, may I apologize if I have overlooked any governmental agency, either national, city, county, or State, in documenting examples of outstanding performance in the field of developing new and unique approaches to accident prevention. As one final example, let me cite an instance where imagination has paid off: The city of Detroit installed a TV Surveillance Project to control traffic on the Detroit freeways. This system was developed by the city of Detroit in cooperation with the Michigan State Highway Department and the Wayne County Road Commission to cover traffic control on a 3.2-mile section of the John C. Lodge Freeway.

This is just another case where imagination pays off, and we all know that there are an unlimited number of situations where we all can apply ourselves toward the development of a solution.

Tips on How To Stimulate Interest of Top Management in Safety

Franklin T. Gerlach, *City Manager and Public Safety Director, Portsmouth, Ohio*

The man with authority, responsibility, and accountability for the total operation of a governmental unit is stimulated to support safety for the following reasons:

1. Good management practice.
2. Disasters, loss of employee lives.
3. Cost factor for workmen's compensation claims. Discovers it costs too much not to have a sound safety program.

Once management is stimulated to action, he should appoint one man to plan, coordinate, and establish the safety program. A central source of authority should be developed for recording accidents and filling out claim forms.

All supervisors must be trained in safety before they can pass the program on to their men. How do you train men on your limited budget?

Sources of trained assistance:

1. Representatives from insurance companies.
2. State industrial commissions or workmen's compensation authorities.
3. U.S. Department of Labor.
4. National Safety Council.
5. Local industry.

When training supervisors in safety, be sure representatives from employee unions are included in the training program so that you will get the full backing of your employees. Be sure your program involves employees on the operating level. Employee participation on safety committees will develop employee leaders who in turn, will form the keystone to your successful program.

Keep employee interest high by constant reminders of safety program by the following:

1. Keep employees informed by posters.
2. Inspect working premises monthly and report any safety hazards needing correction.
3. Use spirit of competition—takes advantage of desire to be recognized.
4. Use safety suggestion awards—
   a. Pens and pencils available through service credit on your membership in the National Safety Council.
   b. Cash awards—nontax money such as proceeds from vending machines.
   c. Give extra days off.
   d. Awards to those who have not had accidents.
   e. Team awards for best safety record.
   f. Safety banquet and speaker. Sometimes outside speakers will be provided at no cost by workmen's compensation groups.
5. Have working areas inspected by outsiders as well as by local employee safety committee.
6. Keep employees posted of progress on the safety program.

Top management has to do the following:

Have every personal injury accident investigated to see what caused it and check to see appropriate action was taken to eliminate the safety hazard.

Have every motor-vehicle accident investigated to determine cause.

Insist that all employees use safety equipment provided by the employer or required by law. This includes personal protective equipment.

Obtain professional assistance in auditing of claims to see governmental unit is not overcharged when premiums are determined in workmen's compensation cases.

Watch off-the-job accidents. They can be just as costly in lost man-hours and in rescheduled work.

Needs to get out among the men and departments to make sure safety rules are being complied with as directed. Look jobs over. Would you work that way (take the risk)?

Step ladders are difficult to get rid of when dangerous.

Use color coding—bright painted colors or reflective tape—on dangerous equipment.

Specify that all new equipment purchased by the governmental unit meets all safety code requirements.

Be careful of employee who wants to use safety program to get even with supervisor or boss.

Must constantly sell safety as interest and enthusiasm wanes when a good job is being done. Let your guard down for a minute and you are in immediate danger.

J. GEORGE EICHHORN, *Grand Lodge Representative, International Association of Machinists, AFL–CIO*

1. State, Federal, county and municipal governments are in charge of making laws and safety regulations. The same governing bodies are in charge of the enforcement of the same laws and regulations. It is a deplorable fact that little or nothing is done to protect the workers of these government agencies in the broad field of occupational and off-the-job safety.

2. Hospitals are a glaring example of the previous statement. They orient their programs to patient or visitor safety, with no formal programs for the hospital employees. There is, of course, the exception as far as radiology hazards are concerned.

3. Employers, to have full success with their safety programs, must learn how to transmit their needs and desires, so as to have appeal to the worker, i.e., an approach that says the company will save money, is not enough. It must be translated to the workers' security, comfort, freedom of pain or death and financial tragedy of the family of the injured, maimed, or dead wage earners.

WORKSHOP: FINDING THE TRUE ACCIDENT COSTS

Moderator: H. Arnold Perkins, *Chief of Health and Safety Section, Western Electric Company, Inc., Baltimore Works*

The Importance and Use of Costs in Accident Prevention

Rollin H. Simonds, *Professor of Management, Michigan State University*

An audience such as this presents a special problem to one attempting to speak on the subject of accident costs. This arises from the fact that probably many among you know a good deal about accident costs, and will, consequently, find much of what I have to say in the first part of my talk "old stuff." On the other hand, there are probably many of you to whom this same material will be new and of great importance. I shall try to solve the problem by pushing rapidly through the parts I think some of you may be very familiar with and going more slowly over those things that I think may be new to most of you.

This talk is divided into three parts: (1) Why costs are important. (2) Latest data on uninsured costs. (3) A system to motivate department managers to minimize accidents.

First, then, the importance. The National Safety Council estimates that occupational injuries cost the Nation over $4½ billion a year. I believe that Gene Miller, head of their statistical division, would say that his organization prefers to be very conservative in estimating such items. He would probably prefer not to be accused of overstating anything of this sort for their own possible advantage; and the figure, even conservatively stated, is large enough to warrant serious attention. My own estimate of current national costs shows employers alone bearing that much cost, with wage losses suffered by employees anywhere from $1 billion to $4 billion, depending a good deal on what the statistician wishes to include.

When one attempts to estimate the losses suffered by injured employees and their families, he runs into many rather philosophical problems not capable of any definitive solution. How can you estimate the loss of earning power resulting from permanent injuries? In case

"Finding the True Cost of Accidents." Speakers are (l. to r.) Professor Rollin Simonds, Michigan State University; Alan Turnbull, Department of the Navy; Frank E. Bird, Jr., Lukens Steel Company; and H. Arnold Perkins, Western Electric Company, Inc.

of death, who suffers the loss? And do you subtract what the deceased would have consumed during his lifetime? What is the effect on a family or the future earning power of members of the family when the major money earner and support of the family is injured or killed? About all we can estimate with some degree of reliability are the losses to injured employees resulting from the difference between their workmen's compensation payments and what they would have earned during the same period had they not been injured in temporary total disability cases. The losses to employers, however, can be estimated with a reasonable degree of accuracy and reliability.

A second reason why accident costs are important is that we cannot rely on humanitarian reasons alone to spur accident prevention. Ideally, we would make all operations absolutely safe. Obviously, this cannot be done. We do not seriously attempt it in any of our personal daily activities, in governmental operations, or in business. As a matter of fact, we probably come closer to it in some business concerns than anywhere else. If we believed in absolute safety, we would probably never drive a car over 20 miles an hour. There would be no street or railroad intersections, only overpasses or underpasses. We would never climb ladders or do many of the things that we are accustomed to doing in our own homes. Obviously, we have to make some kind of calculation as to how far to go in making an operation safe. We cannot put a dollar value on human life or limb, but at some point the activity is considered reasonably safe. We do not want to sacrifice the convenience, pleasure, or the money it would cost to make the operation still more safe.

It is better that business managers be reasonably hard headed. We would not want them to be so concerned about safety or any other desirable objective that they would force themselves out of business, with resultant loss of jobs and productivity. On the other hand, it would be tragic if managers stopped their safety efforts short of the point at which expenditures for safety would be more than offset by gains in profit, or even of the point at which reductions in accident cost would largely offset the cost of prevention.

Intelligent management should offset the cost of accident control, accomplishing savings through accident reduction, including both the measurable savings and those involving employee morale and public relations, which are not easily measured. I know some workers in the field of safety who would say, "Forget about costs," our only objective is humanitarianism. Such sentiments sound lofty, but they are not very practical. Clearly, there is a degree of safety in operations that we must achieve, regardless of cost factors. When we go beyond this

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point, we get into an area where a knowledge of costs of accidents and the intelligent use of these costs will make it possible for management to go much further in the control of accidents than it would otherwise.

The second part of my remarks, I said, would include some recent data on uninsured costs borne by business concerns.

Some of you probably are still accustomed to the old expressions of "direct" and "indirect" accident cost. These expressions simply do not fill the bill, particularly for business concerns which carry their workmen's compensation insurance with an underwriting firm. The words "direct cost" have been used to mean money paid out by an insurance company in the settlement of workmen's compensation claims. The "indirect cost" included the losses suffered by the business concern apart from workmen's compensation insurance. These costs included approximately the following items.

UNINSURED COST ELEMENTS

1. Cost of wages paid for working time lost by workers who were not injured.
2. The net cost to repair, replace, or straighten material or equipment that was damaged in an accident.
3. Cost of wages paid for working time lost by injured workers other than workmen's compensation payments.
4. Extra cost due to overtime work necessitated by an accident.
5. Cost of wages paid to supervisors during time required for activities necessitated by the accident.
6. Wage cost due to decreased output of injured worker after return to work.
7. Cost of learning period of new worker.
8. Uninsured medical cost borne by the company.
9. Cost of time spent by higher supervision and clerical workers on investigations or in the processing of compensation application forms.
10. Unusual miscellaneous costs.

This list I believe represents a slight improvement over the original list of "indirect" costs developed by Mr. Heinrich and others, but it is basically the same.

You will note that if you were to include as the cost of accidents both this list of costs and money paid out by the insurance company in claim settlement, you would still be far short of the cost borne by a company as a result of its work accidents. Typically, the insurance premiums paid by a business concern are about twice the amount of money paid in claim settlement by the insurance company. Thus, a very large element of cost was not included in either the "direct" or "indirect" costs. The more modern terminology of "insurance cost" and "uninsured costs" includes the total cost. The old "indirect" cost concept was identical with the uninsured costs. Incidentally, I do not wish to cast any aspersions on the insurance companies because they have to

collect more in premiums than they pay out in claim settlements. They have costs of doing business just as other concerns do.

To find how much work accidents are costing a concern, and thus, how much would be saved if those accidents could be reduced by 25 or 40 percent; for example, a manager may simply look up his insurance cost and estimate the uninsured costs. Since the net insurance premiums should be readily available, I will talk only on the estimate of uninsured costs. I shall briefly summarize this since you can obtain information on it from the National Safety Council, or with still more detail in the book *Safety Management*, second edition, that John Grimaldi of the General Electric Company and I have written.

For cost purposes, accidents may be divided into four categories: (1) lost-time injuries; (2) doctors' cases; (3) first-aid injuries; and (4) no-injury accidents. You develop an average uninsured cost per case for each of these four categories, then simply multiply that by the number of such accidents that occurred during the period for which you wish to estimate the costs.

Your records should already show the number of lost-time injuries, and probably the number of doctors' cases. If they do not include the number of first-aid injuries, you can estimate by a sampling study the number of these injuries which seem to occur per lost-time case in your organization. No-injury accidents are those which cause a loss of 8 or more man-hours of time and/or $20 or more property damage and which might have caused personal injury, but did not. Similarly, the number of these can be estimated, but we still do not have as much information on this category of accidents as we do on the three types of injury cases.

The latest data that I know relative to rough general averages for the uninsured costs of these types of cases are:

Lost-time cases	$130
Doctors' cases	35
First-aid cases	7
No-injury cases	290

It is clear that the uninsured costs are not typically so very great for the lost-time cases. The insurance cost of these, which might average $1,200 or more, is more significant. The heavy uninsured cost is due to the much larger number of doctors' cases and the even larger number of first-aid injuries as well as the no-injury accidents. There are likely to be 10 times as many doctors' cases as lost-time cases, and a hundred or more times as many first-aid injuries as lost-time cases. Almost all of the first-aid injury cost is of the uninsured variety. We simply do not know, yet, how frequently the no-injury

accidents occur. The only data I have suggest that possibly such accidents may occur as frequently as lost-time injuries.

The last of my three topics, I said, would include a suggestion for establishing a system to make accidents costs work automatically for the prevention of accidents. The way certain costs are commonly allocated seems to say to a department head, "If you want to spend any money for the prevention of accidents, it will have to come out of your departmental budget and add to your expense of operation. On the other hand, if you are unfortunate enough to have any accidents in your department, we will take care of any expenses for these out of a 'general' fund." Let us look at this in more detail.

Workmen's compensation insurance premiums are paid usually out of a general fund, not a part of the budget of any operating department. The same procedure is followed usually to cover cost of claims when a company carries its own insurance. A few concerns make a practice of continuing the injured employee's wages in full while he is disabled, thus going beyond the requirements of the State workmen's compensation laws. In such cases, this wage cost is likely to be charged to a general account, whether the company is self-insured or not.

The great majority of companies have no usable knowledge of the uninsured costs resulting from their accidents. Of course, most of this uninsured cost (wages for time lost, property damage, etc.), except for first-aid costs, actually constitutes a part of the operating cost of the departments in which the accidents occur. Since no specific account is kept of such costs, however, the foremen or other department heads are not usually aware of those costs; at least they have no idea of the total drain on their departments resulting from accidents.

Looking at the cost of prevention work, the operation of a general safety department and the medical dispensary is not ordinarily charged to the various operating departments. On the other hand, the cost of machine guards, of devices for clearing harmful substances out of the air, in general, for engineering safety into the equipment and processes, is frequently charged to the operating department. Often the safety specialist must obtain approval from the department head for expenditures necessary to make such improvements. Personal protective equipment may be paid for all, or in part, by employees, or it may be provided free by the company and charged either to a general fund or to the department in which it is to be used.

Consider, now, the motivating effect of this system on the department head. Suppose the safety engineer believes a machine should be rebuilt, a guard added, or other safety equipment provided, and goes

to the department head to get authorization for the purchase or the construction. A foreman is under pressure from his superintendent to keep his unit cost of production as low as possible. He is accustomed to looking at everything from the point of view of its effect on his departmental cost.

The foreman reflects: "If I add the piece of apparatus, I must pay for it. If I don't buy it, perhaps we won't have an accident anyway. If someone is injured, however, we have insurance to cover workmen's compensation costs. I do not want to see one of my men hurt. Still, the men are not demanding this apparatus. Seems to me as if I would bear the cost of this attempt at prevention, but if we have an injury, someone else pays for it. With the pressure on me to get my costs down, I guess I can't afford it."

This motivating effect can easily be reversed by a change in the allocation of the costs involved. I suggest, first, that a general account be established which would pay for 80 percent of the cost of any safety device or other accident-prevention measure recommended by the safety director. The remaining 20 percent would be charged to the operating department to provide some small check against possible extravagant expenditure.

Second, I suggest that 60 percent of the cost of workmen's compensation insurance be charged back to the operating departments in accord with the relative portion of the accidents for which each department is responsible.

Of course, the principle of insurance is to spread the risk. This involves spreading the risk among companies and among departments. It is for this reason that I suggest charging back to the operating departments only 60 percent of the cost of workmen's compensation insurance. As a further step, I would base the charge to each department on an average insurance cost per lost-time and per doctor's case rather than the actual, specific amount for the particular injury. Another reason for using an average figure, rather than the specific claim settlement cost of the insurance company plus an overhead charge, is that such costs would often not be known for a long time after the accident. By using an average cost we protect the department against the possibly demoralizing charge for a particularly unfortunate injury sequence and, at the same time, make it possible to charge the department at the end of the month in which the accident occurred.

It is not difficult to find an average cost for insurance per lost-time and doctor's case. It is common practice to determine the level of premiums for workmen's compensation insurance, at least in part, on the basis of a 3-year moving average of the cost of settling claims for

the insured company. The man in the insured business concern who is in charge of handling this insurance should know just what claims have been paid by the insurance company. This enables him to do two things. First, he can make sure the employees are receiving all that is properly coming to them, and, preferably, not more. Second, he is in possession of all the facts when negotiating with the insurance company on retrospective ratings or for renewals of the insurance contract. After finding from the insurance company the average claim settlement payments for each of these two categories of cases, and the numbers of each of these two types of cases, he can divide proportionately the balance of the insurance net premium among the cases, thus arriving at an average, overall insurance cost per lost-time and doctor's case.

A further complication may occur to you. Suppose an employee of one department is injured while on the premises of another department. Which department should be charged? If the safety director finds that the employee was primarily at fault, then his department should bear the cost. If the safety director rules that it was bad housekeeping or other fault of the department in which the accident occurred that was largely to blame, then that department should be charged with the accident. If it appears impossible to fix fault, then the charge can be split evenly between the two departments involved.

If such an allocation of costs is made and, in addition, the safety director makes sure that each department head is reminded of the uninsured costs that his department bears as a result of an accident, then you have a built-in system working for accident prevention.

Damage Control—A New Horizon in Accident Prevention and Cost Improvement [1]

Frank E. Bird, Jr., *Supervisor, Safety and Plant Protection, Lukens Steel Co., Coatesville, Pa.*

The 1963 "Accident Facts" publication of our National Safety Council indicates that the costs involved with property destroyed and production lost due to work accidents was $2½ billion in 1962. Investigation reveals that this figure is primarily calculated on the basis of a 1–1 ratio of established direct injury cost data. Recognizing then that these costs involved with property and production losses are essentially based on accidents associated with injury, it staggers the imagination to even guess what industry is paying additionally for the greater number of accidents that do not involve personal injury.

[1] Slides were used to illustrate this presentation.

It isn't difficult for the average industrial supervisor to visualize numerous items that he has seen damaged or destroyed repetitively in his plant. Guardrails, stairs, gates, doors, siding, floors, machines, bricks, and bags within and without the buildings that house industry are typical of the items frequently damaged or destroyed by accident. As verified by the statistics available, it is apparent that one of the few occasions that provokes remedial action to effect the cause is when the property damage is accompanied by personal injury.

Much early research in accident prevention was done by H. W. Heinrich, author of the book *Industrial Accident Prevention*, published by McGraw-Hill in 1931. According to his analysis, for every mishap resulting in an injury, there were many other similar accidents that cause no injury, but could have resulted in property damage. He estimated that in a unit group of 330 accidents of the same kind, 300 accidents result in no injuries, 29 in minor injuries, and 1 in a major or disabling injury. Of importance to this explanation of damage control is the fact that the 300 accidents in this relationship could have resulted in property damage. Heinrich was one of the pioneers in the safety movement that encouraged the point of attack to be the accident and not the injury.

There are many reasons why most safety programs are geared primarily to a remedial emphasis of injury-type accidents. One of the major reasons is, logically, the fact that the industrial safety movement was fostered by the early compensation laws that highlighted the need to eliminate the causes of accidental injuries and death that once existed with appalling frequency in American industry. Thus, it was logical that early efforts would focus primarily on the obvious injury-producing accidents. This philosophy, while originally sound, is proving today to be both a boon and a barrier to further injury prevention efforts. Many industries have the same safety rules, methods of investigation, and analysis that were basic to this emphasis described 30 or more years ago. While agreeing in principle to the concept that injuries are prevented by eliminating accident causes, the practice of gearing the safety program to the broader concept of accident prevention is generally uncommon.

Regardless of our acceptance of Heinrich's original 1–29–300 ratio, the average safety specialist will readily admit that there is a big ratio of near-miss (more accurately termed near-injury) accidents to the type involving injury. It is only logical to assume that by directing our programs broader to include all accident types, we will eliminate not only a greater proportion of the practices and conditions that breed accidental injury, but will also remedy the cause of extensive loss in property damage.

Many comments have been made and written recently pointing out that accident prevention has reached a plateau in its effect on injury control. This can be readily seen by making a comparison of the progress in the disabling injury rates from the period of 1949 through 1958 to the last 5 years. During this later period, there has been no appreciable decrease in the all-industry average frequency rate compared to a 39-percent decline in the earlier period cited. An effective damage control program could be the vehicle to create new management zeal and a virtually untapped source for the removal of accidental injury causation.

During the remainder of this presentation, I would like to discuss the actual cost improvement results achieved at Lukens, and the program methods that produced them. The earliest accurate report on results of our damage control program appeared in the 1960 annual report. The first year our program was in full control was 1959, and for all comparison purposes, this was our base year. One page of this particular report made reference to the program by stating, "The first year's organized experience with a relatively new industrial safety approach to the area of accidental property damage was completed in 1960. The program's contribution to cost improvement was estimated to be half a million dollars."

Another page of the 1960 annual report pointed out economic highlights of the year's operations. Considering that $1,430,000 was paid to the owners in dividends and $3,500,000 retained by the company to be reinvested in our business, we all felt rather proud of the half million share the safety program contributed to the company in this historic year for accident prevention at Lukens.

Let me emphasize at this point that groundwork required to get our program working smoothly in order to produce this first report took 5 years of careful planning and development.

Looking back through the years, one of our first program objectives was to clearly establish in everyone's mind exactly what we meant by accidental property damage as compared to routine maintenance (normal wear and tear). The following definition of an accident was used as a basis for this understanding: "An accident is an unintended happening, that may or may not result in property damage, personal injury, work process stoppage or interference or any combination of these conditions under such circumstances that personal injury might have resulted."

It might be helpful to look at an entire hypothetical accident sequence to better see this relationship of property damage to personal injury as indicated by the definition given:

1. Heedless Harry is really living it up (unsafe act).

2. The result—an accident.
3. Involving property damage and personal injury (of course it could have been either, depending upon Harry's luck).
4. A look now in retrospect at Harry's unsafe action reveals that he set the scene for other accidents in addition to his own.

In addition to the heedlessness (as in our hypothetical case) involved with many accidents, haste, inattention, and ignorance seem to be outstanding attitude problems that all end up in a junk pile, spelling costs and injuries.

Now that we see the relationship between personal injury and property damage, let's first explore the development of our reporting system in all accident control, since any accident prevention program is only as strong as its ability to discern the true nature of its problems. The first method of reporting is through employee compliance with our general safety rules. In October 1956, a broad revision was made in our rules to include the reporting by all employees of any accident resulting in personal injury or property damage.

General Safety Rule No. 2 was rewritten to read: "Report immediately to your foreman or supervisor any condition or practice you think might cause injury to employee or damage to equipment."

The key to our whole program, General Safety Rule No. 5, was rewritten to read, "Whenever you or the equipment you operate is involved in any accident that results in personal injury or property damage, regardless of how minor, you must immediately report it to your foreman or supervisor. Get first aid promptly in a company dispensary."

In order to assure the success of the program, known violators of this rule have been equitably disciplined. A number of employees have been given time off from work for gross violations (since the adoption of this rule in 1956), while written and verbal warnings have been used more widely.

Fully recognizing the natural reluctance on the part of employees and supervisor to report the fact that they were involved in damaging company property, a simple report form maintained by the foreman of each repair shop serves as the same control to our accident damage program as dispensary records serve our injury prevention efforts. A damaged-equipment repair tag was introduced next and was required to be used by all employees whenever equipment was sent for replacement or repair; a "reporting" control to further pinpoint accident location, time, date, and apparent cause.

One of the most effective methods of control is the investigation of each accident in order to determine corrective action and prevent recurrence. Mass collection of facts obtained from good accident in-

vestigation properly correlated, formed patterns of common occurrence that were used effectively for further control. A new standard practice including personal injury and property damage was adopted as a tool to attain desired goals in proper accident investigation.

Essentially, the supervisor or foreman in whose area of responsibility the accident occurs is responsible for conducting a thorough investigation and submitting the official supervisor's accident report form. One form is used to cover personal injury, property damage, or both. Since identical controls are used to prevent accidents, whether they be personal injury or property damage, no conflict presents itself in the application of this two-purpose form and its broadening effect on the total accident control outlook of supervisory personnel.

Just as the disabling injury provides ammunition for drawing more extended management effort, so by standard practice any property damage accident of $1,000 or more is dealt with in the identical manner of a disabling injury. An immediate notice of serious property damage is delivered to all superintendents and managers. The superintendent concerned is required to hold a formal hearing of all persons involved in order to determine adequate remedial action. The results of this hearing are promptly forwarded to the manager, who then calls a final review meeting which includes the superintendent, key supervisors, and myself. This opportunity for top management to actively demonstrate its concern for accident prevention tends to keep everyone more aware of the accident problem and their individual responsibilities to maintain effective controls.

Information on property damage or personal injury accidents that are not classified as major, yet deserve special attention, is distributed to all members of management on a special flyer.

It might be useful to look at a few typical accidents, in order to realize the importance of the remedial action resulting from investigations. Accident No. 1 involved an ingot being lowered into No. 48 pit. The crane operator struck the front top of this pit with his ingot dog with resulting repair costs being $200. However, in order to make the necessary repairs, this entire pit had to be shut down. Rehandling of the ingots that remained in the pit, reheating, rescheduling, and 4 hours of pit delay time added extremely large additional costs.

Accident No. 2 involved one of our mill ingot buggies. The mechanical department personnel were changing rolls in our mill, using a large hook to grab the roll and pull it out. Electricans did not tag the pulpit control that operates the ingot buggy. The operator sent the buggy down to service the mill. Because of insufficient clearance between the buggy and the "C" hook assembly being used to remove the mill roll, a collision occurred that bent the main frame of the buggy.

Three turns were required for temporary maintenance since permanent repairs would have required 8 to 10 days of downtime. The immediate cost of temporary repair was $1,250. It is interesting, however, that permanent repairs have still not been made because of the extended downtime necessary. The maintenance bills for repair and replacement of wheels, axles, and collector shoes occurring as a result of the bent frame have continued for months. On several occasions since the accident, two turns have been required to do this work.

Accident No. 3 involved an ingot dropping on our 206-foot steel yard crane scale. Although the replacement scale part cost $175, it was necessary to ship the entire scale back to the factor for repair. During the week required for repair, all slabs formerly weighed on this scale had to be trucked to a scrap supplier's yard outside our plant and then returned for preheating. Delay time was estimated to have cost at least 40 times the immediate costs of the accident.

The more management is explicitly made aware that people will be hurt or property damaged through certain acts or conditions, the greater the possibility that action will be taken to prevent it. The accident analysis phase of our damage control program pinpoints specific items damaged repetitively and the agencies involved. Supervision concerned are thus equipped to place concerted effort on single specific objectives.

A detailed quarterly analysis is furnished to all key management personnel and includes a comparison of all accident-damage costs this year to date to that of last year. It helps maintain a continued awareness of particular departments, agencies, and items needing attention. A colorful barometer on the cover gives flash indication to busy management personnel on the degree of action necessary on the report contents. This quarterly report carries the typical analysis of injury types, agencies involved, causes, etc., and in addition, an analysis of the property damage phase of our accident program. Let's examine several of the pages of one particular quarterly report dealing with property damage:

A breakdown by the agency or act inflicting damage revealed crane involvement with well over 70 percent of our property damage accidents. Four departments stood out as shareholders in the greater majority of all damage costs. Further analysis revealed the cost of accidents by items damaged. A severity rate in dollars per unit or hourly rated man-hours of time is used in our plant to indicate trends in control performance. Accident damage severity is expressed as immediate costs per million hourly rated man-hours worked.

The severity rate (immediate costs) for 1959 was $62,000 per million hourly rated man-hours worked. For program comparison purposes,

this was our base year. Our 1964 year-to-date damage severity rate, $21,500, is substantially below the base year's rate.

To realize more fully the cost improvement aspects of this comparison, let's examine more closely the 1964 accident rate of $21,500 per million hourly rated man-hours worked. This was an improvement of $40,500 per million man-hours worked over the 1959 performance. Sampling of our repeated costs indicate there is a minimum relationship of 4.3–1 of immediate costs at Lukens. The value of our total effort becomes more evident when we apply this ratio to determine total costs.

Here are two examples of accident repetition highlighted by the analysis phase of the program with action taken that helped to bring about this cost improvement:

1. In one year, 1,600 spindles on hand grinders were replaced. Investigation revealed that at least 75 percent of this was due to the unsafe practice of striking the locking nut to loosen it in order to remove the wheel. (All grinders are now provided with a special band wrench; the knowledge gained through the accident investigation also brought about improvement in the spindle quality and design which has also reduced breakage substantially.)

2. The guardrailing on the top of seven shears was struck and badly damaged by material handling devices 38 times in one year. (Using solid plate guards instead of pipe railing and rounding of railing corners has greatly reduced catch points at these locations, reducing damage at least 50 percent.)

Since materials handling equipment operators are involved in 80 percent or more of all property damage, it was logical that one of the many justifiable outgrowths of our program would be a well-developed training program. The new training program that evolved includes the licensing of operators and the maintenance of licensing standards. A periodic inventory of individual operator's accident records is routinely made.

To keep the crane operator keenly aware of his particular important role in the prevention of property damage and personal injury, a special publication called "Crane Operation News" is mailed to his home each month. This issue discusses typical accidents and remedial action that should be taken, unsafe practices and ways to improve performance.

To motivate key management personnel even further, an accident damage control chart is posted in a most conspicuous position in our superintendent's conference room where the general manager points to weekly trends each Friday. A weekly publication called "Safety Facts" is distributed weekly to all supervisors in our plant. The lower

left side of this report gives personal injury facts, the lower right side gives property damage facts. A total safety performance rating is given each department in the right-hand margin. This rating includes an evaluation of housekeeping, protective equipment, communications, actual injury experience, personal injury and property damage investigation.

It is the opinion at Lukens that the addition of damage control to our injury prevention program more truly represents a positive program approach to total safety.

In one of numerous articles published both here and abroad on our damage control work at Lukens, Dr. S. Laner, Head of the Human Factors Section of Operational Research for the British Steel Industry, states: "Surprisingly few people seem to be able to appreciate that what goes on under the name of accident prevention is in the main injury prevention; and that all so-called accident reports are actually reports on a selected sample of accidents resulting in injury to men. It is, of course, understandable that accidents terminating in injury to life and limb should assume special prominence in human minds. Yet, paradoxical though it may sound, this exclusive concentration on injury causing accidents is also the chief obstacle to further big steps forward toward their prevention. In the light of all this, it is scarcely an exaggeration to designate damage control as a 'modern key to safety,' in tune with the technological advances typical of the second half of the 20th century."

Merrick Jackson, Executive Editor of *Steelways*, in an article called "Getting at the High and Hidden," stated: "The statistics of accidents prove that as less accidents take place, less people get hurt. Prevention of damage to equipment also serves to prevent hazard to life and limb. Safety is indivisible; promotion of safety at home contributes to safety in the mill; prevention of accidents to equipment helps prevent injuries to people. Steelmen know, furthermore, that with procedures improved and equipment better protected, the individual works more effectively and profitably—and with a feeling of greater security. From every vantage point the Damage Control Program looks like money in the bank."

A final reason for the justification of this approach is the fact that a company desiring to earn 5 percent net profit after taxes would have to sell six and a quarter millions in additional annual sales volume to compensate for accidents costing $6,000 in damage per week.

In closing, I can say with a great deal of pride that this tremendous economic drain on our company's pocketbook from accident property damage has come into good control. With improved knowledge, skills, interest, morale, and motivation, we have reduced injuries to employees

and damage to equipment. The greater and safer production of better products at lower cost means increased business and prosperity for our company and its employees.

In addition to the normal rewarding feeling that comes from any service to their fellowman, our safety engineering staff now realize how substantially their staff efforts contribute to the economic health and growth of their company through this new dimension in accident prevention—total safety programing.

Accident Cost Analysis—Problems in Application

ALAN TURNBULL, *Assistant Director, Safety Division, Office of Industrial Relations, Department of the Navy, Washington, D.C.*

Before we start to consider problems in applying a formula to estimate accident costs, let me review briefly what is generally included in the formula:

The total cost of the accidents in a plant is the sum of: the insurance cost, the average cost of a disabling work injury multiplied by the number of disabling work injuries, the average cost of a doctor's case multiplied by the number of doctors' cases, the average cost of a first-aid case multiplied by the number of first-aid cases, the average cost of a no-injury accident multiplied by the number of no-injury accidents, plus all exceptional costs or costs due to catastrophies.

Our first problem is one of definition. You have recognized, of course, that the most commonly used factors in the formula tie in with the injury classifications of the American Standards Association Z16.1 code on "Recording and Measuring Work Injury Experience." Thus, they are susceptible to the same manipulation. Identical cases may be disabling injuries in one instance and in another may be light duty cases or doctors' cases depending on the availability of light duty work or the opinion of the doctor authorized to treat the case. Where there is a single plant physician, decisions as to ability to return to work should be stable providing that appropriate work is available at all times and the pressure to return the employee to work is the same at all times. Where an employee may be referred for treatment to any of a panel of doctors, or where he may use the services of a doctor of his own choice, consistent opinions on ability to return to work are susceptible to greater variation.

The decision of a nurse as to whether a case should be referred to a doctor also makes a difference in the classification—and the cost—of a case. Even when a nurse has standing orders on the kinds of cases to refer to a doctor, she may consider her opinion of the severity of a con-

dition as a determining factor in some referrals. It is obvious, therefore, that variables may exist.

These are further complicated by the necessity to make decisions on whether certain cases are occupational or nonoccupational. Let me give one or two examples: a man who had strained his knee playing baseball at a family picnic, fell while climbing a flight of steps at the plant a few days later. Was this an aggravation of an existing disability or was it due solely to an existing disability? A man with arthritis in his back suffered severe pain when he twisted his body to place a box in an awkward space. As a result, he was ordered by the doctor to stay in bed for several days. Was this an aggravation of an existing disability? Was it due to the awkwardness of the location of the storage place? Or was it due entirely to the worker's preexisting condition?

The Committee on Interpretations of the Z16 code committee has been called on to resolve the chargeability of more than a thousand cases, each differing in some respect from all the others. The members of the committee all worked on devising the reporting system and are thoroughly familiar with the intent of each provision of the code, yet there was not unanimous agreement on all of the interpretations rendered. In view of this, can we consider the plant safety engineer or someone else in the plant competent to decide the chargeability of "questionable" cases? Can we depend on the decisions of insurance carriers or State workmen's compensation boards? Their decisions are based on the compensation laws of the various States—and these laws are not uniform.

What is a property damage case? Much thought has been given to this question by many people—and there is still no adequate answer. If there is a hidden defect in a piece of equipment when it is delivered from the manufacturer, if the buyer has inspected the equipment and accepted it, if it is properly used within its capacity, if it is properly maintained and still breaks down unexpectedly, is this a property damage case chargeable against the buyer and user of the equipment? Should the decision on chargeability be based upon the action of the plant using the equipment? Should there be a "statute of limitations" on the hours and type of use made of the equipment before we decide that the machine broke down as the result of a hidden defect, improper use, or obsolescence? An arbitrary decision to charge only those cases in which personnel *could* have been injured helps to some extent in making a decision on chargeability. But how do we decide in some cases whether or not anyone could have been hurt? Do we decide it on the basis of whether anyone was within range at the specific moment of the accident or whether, by a million to one chance, someone con-

ceivably *might* have been within range? Making a decision on the chargeability of a property damage incident may be as difficult as deciding what constitutes gambling—a poker game, a raffle for some charity, a bet on the horses, a bingo game, or a flyer on the stock market. Yet, a decision must be made if we are to know the cost of our accidents.

Some plants may be able to collect data on all property damage cases (or, as they are sometimes called, no-injury accidents) at all times. Others may collect data on these cases only during the period on which they will base the dollar figures for each of the factors in the formula and then work out a ratio of property damage cases to disabling work injuries. This is what we did in the Navy. Our ratio came out at 1 to 1. This may seem like an excellent way to arrive at cost estimates without burdening a plant with the necessity of making continuing reports on all property damage cases after the study is completed. Although it has this advantage, it also has some disadvantages. There is no assurance that the ratio will remain constant. Through excellent work on injury prevention, the number of injuries may be sharply reduced while the number of property damage cases may or may not remain relatively constant to increases or decreases in the number of injuries. Furthermore, costs of material, supplies, or equipment generally tend to rise. Few things are cheaper, or even the same price as they were a few years ago. In this case, the average cost of no-injury cases must be continually raised as prices rise. We can adjust this figure periodically by tying it to some sort of national or industry price or cost index. But which index is most closely related to your plant?

There is a way to get around that, too, of course. In the Navy, we based our ratio on cases costing between $20 and $300. As costs moved up, cases which formerly cost less than $20 moved up into the $20–$300 range, and cases which formerly fell within this range moved out of it. We maintained the requirement that all cases costing more than $300 had to be reported. As a consequence, assuming an offsetting of cases moving into the range by those moving out of it, we still use a 1 to 1 ratio, but we have more cases now which have to be reported.

If you are going to use a ratio of property damage cases to injuries, you must set a top and bottom dollar limit for the cases to be included in the ratio. Cases falling beyond the upper limit must be reported separately in the catastrophe or, as we in the Navy call it, serious damage category.

Let us assume that all the problems which I have discussed relating to definitions or interpretations have been resolved. Let us assume that all these variables are now constants. Let us assume that all

persons are fully informed and completely understand what goes into the cost formula and into which factor of the formula it goes. These are sweeping assumptions!

Let us talk for a few moments about cost formulas. There are several. People seem to feel a need to know the true dollar costs of accidents; they also seem to think that they can obtain these figures in some quick, easy way. There is no easy way. If you expect management to put any credence in the figures you supply, you must be able to substantiate their reliability. You must have a sound basis following recognized accounting or statistical procedures. Dr. Simonds has described his formula to you. I know the amount of work that went into it, because I participated in the study and developed the formula used by the Navy. Although our formulas are basically the same, there is one important difference. Dr. Simonds' formula was developed for private industry; mine was developed for Federal Government operations. Professor Simonds' formula contains a factor termed "Insurance Cost"; the Navy's formula does not. The reason is easily explained. The Federal Government carries no insurance on accidents to its own property under its own control, or on injuries to its own personnel paid from appropriated funds. You may consider it as self-insured. Consequently, all of our costs must be absorbed into the remaining factors of our Navy formula.

Some of the delegates present may represent Government agencies or large companies which are self-insured. Some companies which are self-insured may set aside periodically into a separate account an amount of money which may be likened to insurance premiums. These conditions will affect your choice of a basic formula. You must recognize that, even though the factors in your formula are precisely the same as the factors in the formula employed by another company or agency, the actual dollar cost of each factor may vary. Let's discuss injury costs first. Wages, in general, depend on the amount of skill required to perform the work, the degree of physical exertion required, the scarcity of workers in a particular occupation, and the desirability of the work. Wages for even the same occupation vary, in some cases, according to the geographic location of the plant. It follows, therefore, that, if wages differ, the average cost of an injury of equal severity must also differ. If the cost of materials, supplies, and equipment in your plant cost more than the materials, supplies, and equipment in another plant, the average cost of property damage in your plant may be higher unless the top and bottom dollar limits which you have set for inclusion in your ratio are identical. If you do not use a ratio you do not have to consider this possibility, but you still have to consider a possible difference in the average cost of property damage cases.

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If you do adopt the actual dollar costs for each factor in the same formula used by another company, you must accept the fact that the costs at which you arrive are estimates based on someone else's experience and may be far afield. It is strongly recommended that you conduct your own study to establish dollar values for each average used.

And here we come to another set of problems. Supervisors and employees alike tend to regard with suspicion any study aimed at determining costs of accidents and injuries to them or their departments. There is an uneasy feeling that somehow, some time, this information may adversely affect them. You can't blame them for wanting to "look good." It may, therefore, be quite possible for the accident and injury record to be better than usual during the period of the study due to increased effort, and that resulting data may not be representative of average experience.

The work force should be well briefed before the study in order to allay any fears of what may result as a consequence of the study. When should the study be conducted? Rush periods and slack periods should be avoided, because the tempo of the work is different, the work itself may even be slightly different, and decisions as to whether an injured worker should be assigned to light work or sent home for a few days may be different. If you are to obtain an average dollar cost, it should be determined during a period when the workload is "average" and representative.

Some kind of control is necessary to insure that all accidents and injuries are reported, that none are covered up in an attempt to look good, and a check should be made to see whether the medical department is maintaining its same pattern in estimating the severity of injuries.

A serious problem arises in determining the cost of property damage. Who is qualified to estimate these costs. The supervisor? The department head? The head of the maintenance department? On what should costs be based? If only repair is needed, the cost may be obtained fairly easily, but if a piece of equipment is damaged beyond economical repair the problem of determining cost is more difficult. Should it be based on the initial cost of the item? The unamortized cost? The current cost of a similar replacement? What if the replacement is not similar? What if the cost has been completely amortized?

The questionnaires and report forms used to collect the data must be well-designed in order to be able to elicit all the information necessary so that all elements of cost, direct and indirect, or insured and uninsured, may be discovered. The forms which Dr. Simonds has developed are excellent and I advocate their use.

When all the data are collected, tabulated, and analyzed, you may discover some things which will surprise you. You may find, for instance, as the Navy did, that it may not be practical for you to establish a ratio of first-aid cases to disabling work injuries. Even within the same plant these ratios may, and probably will, vary from department to department. Even within the same department the ratio may fluctuate. This is the reason why Dr. Simonds' formula and the Navy's formula do not use such a ratio. Each category stands alone. The average cost of an accident in each category also may vary from department to department. This fact may lead you to feel that the average dollar value assigned to each injury category should be different and that you should apply the formula with different averages for each division. Let me caution you against this. Cost formulas have to be based on fairly large samples. Costs computed for a small department must be averaged out over a long period of time, in some cases, years. In that length of time the average not only may, but probably will, change. An average obtained over a short period of time in a small department may not be representative. The same is true of a small plant. If you apply the overall plant averages for each injury category to an individual department you may be completely misled—because an average is an average. It is composed of all the costs, high and low. Consequently, when you apply an average to a high cost department, your figure is an understimate; when you apply it to a low cost department, it is an overestimate. The average applies to the plant as a whole and may or may not be representative of any one department in the plant. You have to understand what you have before you can apply the results you have obtained from your study. The same cautions about obtaining averages for each factor in the cost formula for a small department also apply to a small plant. If the study period is too short, your averages may not be representative. If the period of the study is long enough to obtain sufficient data on which to compute averages, the costs of accidents and injuries may have changed by the time the study is completed thereby affecting the current and subsequent value of the averages you have established.

Which brings us to the next problem—keeping the formula up to date. The average costs you have established for each factor in the formula will not remain good averages very long. There are two principal reasons for this. One, wage levels change and as wages go up, the average cost of time lost also goes up. Two, the pattern of accidents and injuries within the plant may change due to technological advances. The changing pattern of sources and causes may produce injuries of a differing degree of severity and differing costs for property damage. So, the dollar values assigned to the various

factors of the formula must be updated from time to time. These changes may be geared to appropriate indexes for a time if the kind of work performed in the plant has not changed significantly, but eventually a new study will have to be made. In the Navy, for instance, the average cost of a disabling work injury in 1946 was $280, and the average cost of a first-aid case was $14. Today, we estimate the average cost of a disabling work injury at $485, and the average cost of a first-aid case at $22. In this period of time we revised our average costs for each factor five times. Because of technological changes, I feel that a new study is necessary.

A few moments ago I mentioned that you might expect to find some surprising things from your analysis of your study. In the Navy, we found that the cost of the total of all our first-aid cases exceeded the cost of the total of all our disabling injuries. As you can imagine, this has led to a more intense effort to discover the sources and causes of first-aid injuries, and to increased emphasis on the prevention of those minor injuries which most people tend to discount, feeling that they are relatively insignificant in the cost picture.

Now we come to the crucial problem. What do we do with the figures on cost which we have obtained? First, we recognize that these figures will not prevent accidents or injuries. Analysis of accident reports on sources and causes is necessary for that. What we have from our cost formula simply tells management how much accidents and injuries cost. It is simply a tool to motivate an intensified accident prevention effort. Injury frequency and severity rates could have the same effect on management—if the implications of these rates were thoroughly understood. The advantage of using accident costs as a tool for motivation lies in the fact that money talks—loud and clear. It has often been said that if the cost of accidents were known, there would be greater effort to eliminate or at least reduce accidents.

A little over 3 years ago, Congress enacted legislation requiring each Federal agency to pay the cost of all injuries to its employees. Prior to this time, the Bureau of Employees' Compensation of the Department of Labor paid for medical costs, costs of prosthetic appliances, vocational retraining, fatality benefits to dependents, and the cost of all compensation for time lost from work without pay from annual or sick leave, for all Federal employees. The intent of the legislation was to call to the attention of the heads of all agencies the cost of their injuries and thereby to bring about a more intensive accident prevention effort.

Did this knowledge of injury costs fulfill its purpose of acting as a tool to increase emphasis on injury prevention? Judge for yourself. In 1958 prior to passage of the act, the Federal employee disabling

injury frequency rate was 8.1; in 1961, it was 8.0; in 1962, it was 7.9; in 1963, it was 7.8. These can hardly be called spectacular results! Perhaps we can attribute part of the reason to the rule of diminishing returns. When an injury rate has reached a plateau, a point where it costs a dollar to save a dollar, there may be a feeling that the results do not justify the expense of the effort. As persons who are dedicated to saving lives and reducing human suffering we argue against this attitude on a moral basis. Another part of the reason may have been the fact that the total dollar cost to the Federal Government for all its deaths, disabling injuries, medical care, prosthetic appliances, and vocational rehabilitation of injured Federal employees was only one-fourth of 1 percent of its employee payroll costs.

There is a possibility that you may find as a result of your studies that your on-the-job disabling injury cost is less than your off-the-job disabling injury cost, and less than the cost of paid sick leave taken by your employees. This weakens the effect of your on-the-job accident figures. It is my personal feeling that we can be most effective in discovering and playing up the cost of property damage and, believe me, this is *most* difficult.

Accident costs for one plant cannot be directly compared with the accident costs of another plant unless absolutely every factor and condition are identical, a situation which, for all intents and purposes, does not exist. You cannot directly compare last year's costs with this year's costs, even in the same plant, because not all conditions and situations remain static. You have to make statistical adjustments to make the costs of different years comparable with each other. This lack of direct comparability does not promote the use of accident cost figures.

Ideally, accident costs for a particular year should be compared with other expenditures or operating costs for that same year. We should be able to estimate what portion of our overall costs were expended for accidents and injuries. If it was a significant percentage, we have a valuable tool to convince management of the need for increased accident prevention efforts.

There are costs to management in addition to those included in any accident cost formula. There may be lowered production over a long period of time due to poor employee morale resulting from accidents. There may be difficulty in recruiting new employees because of publicity of poor accident rates. There may be employee turnover following a bad accident, and others.

There are accident and injury costs to employees, to the community, and to society in general, in addition to those borne by management. If we are to achieve maximum success in accident prevention we need

to develop some means to make *everyone* safety conscious, not only management.

What I have said today is not to be construed as an argument against the use of accident costs as a tool in our accident prevention programs, nor to cast any doubt on the validity of any cost formula. It is simply a hard-headed appraisal of the state of the art today and a recital of the difficulties to be overcome. I personally advocate the use of accident costs, but realize the need for intelligent and judicious use of accident cost figures. Much work still remains to be done in this field.

WORKSHOP: OFF-THE-JOB SAFETY AS AN ELEMENT OF TOTAL SAFETY

Moderator: THOMAS J. BERK, *Safety Consultant, Metropolitan Life Insurance Company*

Off-the-Job Accidents—A Prime Concern of Industrial Management

STANLEY LEARNED, *President and Chief Executive Officer, Phillips Petroleum Company, Bartlesville, Okla.*

Although most of the workshops in this conference are being devoted to aspects of occupational safety, we in this meeting are concerned with *prevention of nonoccupational accidents.* We have really wound up with the biggest end of the stick. Although prevention of occupational accidents remains a prime problem, it is off-the-job accidents which are rising at the most alarming rates and which are the biggest threat to our Nation. During our meetings we should keep uppermost in our minds the glaring fact that today a worker is about six times safer in his plant than in his home.

I would like to use my few minutes to review briefly: (1) why business leaders should be concerned about off-the-job accident problems; (2) what they can do to mobilize leadership in attacking these problems; (3) some examples of how they can use tools at their command to implement off-the-job safety programs; and (4) some services available to them from the National Safety Council.

We cannot attach an adequate value to the loss of even one human life. I think that we who are champions of safety should view our job in terms of that one life and all it means in human tragedy to those left behind. Above all, ours is a humanitarian cause. Today, however, I want to discuss the costs of accidents to our economy and to business. I hope you will understand and excuse my neglect of the humanitarian side.

Accidents have profound effects upon the economy. In an average year, more than 10,000 males under age 25 are killed in motor-vehicle

Panelists discuss off-the-job safety as an element of total safety. R. B. Tuttle, New Jersey Bell Telephone Company, at lectern. The session was moderated by Thomas J. Beck, Safety Consultant, Metropolitan Life Insurance Company.

accidents alone. Not only are these the present and future buyers of products, they are actual or potential heads of families which some day might be buyers of products. The present "average income" in America is $5,500–$6,000. During the 45 years between the ages of 25 and 70, the head of the household controls $200,000 of disposable income—his purchasing power. The 10,000 families would represent $2 billion of purchasing power. If they're killed off before they reach 25, however, they won't be able to use that purchasing power. And this is not a one-shot disaster. Since 10,000 youngsters under 25 are killed every year, this means a $2-billion reduction of potential business—every year!

But we've only considered deaths of males under 25. What about the 20,000 males over 25 killed in motor-vehicle accidents each year? And the 10,000 women? The losses to our economy from their deaths stretch into additional billions.

Moreover, for every fatally injured person, dozens are seriously hurt. Hundreds more are hurt less seriously. The financial impact of accidents affects the individual's and family's ability to purchase goods and services. Perhaps by this time you are convinced, as I am, that accidents materially reduce sales.

At the present time, off-the-job accidents alone cost employees and employers of this Nation more than $7 billion a year. Put another way, this amounts to more than $100 for every employed person in the country.

Money is paid directly in the form of wage benefits to absentee workers. For example, in the company for which I work, the cost of our unavoidable absence plan alone was approximately $3 million in 1963. Much of this unavoidable absence cost was due to off-the-job accidents.

A lot of the accident cost is hidden. An employee not at work because of injury off the job may not be replaced immediately. If he is a salesman, sales may be lost. If he is in manufacturing, his absence may result in overtime pay to others or in added wage costs through upgrading all along the line. If he is a technical employee, his absence may mean the loss of an important scientific or technical edge vital to the company.

Some of the cost is hidden even deeper, although still very real. As accidents in a community rise, so do insurance costs, taxes, and welfare contributions. Business and industry pay a major share of this bill, too. These facts should bring home to every business leader the tremendous stake he has in the prevention of nonoccupational accidents in this country. One of our main jobs as crusaders for safety should be to get these and similar facts to the business leaders. Once

these leaders have been fired up to join the campaign against off-the-job accidents, they will naturally have the question, "What can we do?"

I believe that the most significant role a management man can play in this campaign is suggested in the theme of this conference, "Mobilizing Leadership for a Safety Breakthrough." The key words in this are "mobilizing leadership." Various business leaders may have their own methods for accomplishing this in the area of safety. One step they must take, it seems to me, is to make it plain to their employees, and the people of their communities, that they are strongly behind all responsible safety organizations and programs. The most important way to do this is to join and participate in local safety organizations and encourage employees to do likewise. Meetings with supervisors, letters to employees, and statements in the press are other typical ways to get this message across.

Words, of course, must be backed up with deeds. And one deed which is necessary on the part of industry is greater financial support to both local safety councils and the National Safety Council. Such contributions should result in accident-rate improvement which will more than save the cost to the contributor.

Business leaders should also join in the effort to get needed safety legislation passed. Since causes of safety problems are developing so quickly in our accelerated society, we need to be on top of them constantly to make certain that legislation is devised and passed when necessary to solve the problems. Such legislation is particularly needful in the traffic accident phase of the safety problem. Current needs in some States include the compulsory use of seat belts, stronger driver's license laws, State aid for driver education, and increased funds and personnel for departments of public safety.

Other steps management men can take to advance the cause of off-the-job safety lead me to the third point I want to discuss—how business leaders can use some of their own internal tools to implement off-the-job safety efforts. In discussing this point, I will necessarily have to cite some examples from my own company.

Most industrial organizations have trained and skilled safety experts to develop and administer occupational safety programs. Management should encourage these safety people to lend their time and abilities to community efforts to improve off-the-job safety. The company should sponsor their attendance at safety conferences and meetings devoted to nonoccupational as well as occupational accident problems.

Safety education is a vital function to which management can direct some of their own resources. In Phillips, we direct a great deal of our safety education effort to preventing off-the-job accidents. Bul-

letin board displays, safety posters, and company publications are some of the tools we use to do this. We also put in the hands of employees certain selected literature designed to eliminate accidents through better education.

We devote a number of safety meetings at our field locations to off-the-job accident problems. Information from these meetings often has a double-barrel impact by filtering down to a worker's family and friends.

Like those of many companies, our film library contains many well-prepared films on off-the-job safety subjects. These are, of course, available to all employees. In addition, we lend them to schools, civic clubs, and other interested groups when merited.

Many employees of industry and their families live in isolated areas where medical facilities are remote. These people present a special responsibility in off-the-job accident programs. In Phillips, we make first-aid training available to these families, furnish them first-aid kits and other emergency supplies, and take similar measures to help insure their safety.

In the area of motor-vehicle safety, industrial managers have a special responsibility to make certain that their own house is in order. The safety program covering operators of company vehicles should include a carefully prepared set of rules and regulations. These regulations should be stringently enforced, and disciplinary measures taken to correct offenders. For every employee who drives a company vehicle regularly or periodically, there should be tests to examine driving skill and knowledge, and mental and physical limitations. A training program supplemented by attitude conditioning material is a must for getting qualified drivers to drive safely. Individual incentive awards for driving without an accident are valuable tools to induce those who drive as an occupation to operate their vehicles more safely. Obviously, company vehicles should be kept in top operating condition.

Other steps which companies can take to help lick the traffic accident scourge include the use of advertising to spread highway safety information, and promotion of driver education training classes for young adults.

In addition to effectively using their own tools in the campaign against nonoccupational accidents, business leaders should make use of services of the National Safety Council. These include a broad range of educational materials, a research and factfinding organization which can help in pinpointing the causes of particular safety problems, the counsel of trained experts to find solutions, and tried and proven programs for carrying out the solutions.

In conclusion, let me stress that the potential for harm from accidents has never been bigger. This will be increasingly so in the future. With more leisure time, people will be more exposed to off-the-job accidents. There will be more automobiles on the road. As a result of the population explosion, there will be more people—and people cause accidents. With more complicated and high-powered equipment around the home, hotter power boats, more sporting activities, and a stepped-up standard of living, in general, you have an endless line of potential accidents.

This look at the situation shows that the challenge we face in stemming the tide of accident tragedy and cost is not less, but greater than it has ever been.

To successfully meet this challenge requires leadership, and it is well that we are stressing leadership at this conference. Each leader, however, business manager, safety expert, legislator, law enforcer—all crusaders for safety—must constantly be aware that the main army in the war against accidents is the public. Our biggest job is to make all citizens realize that the accident menace is one of the gravest problems of our generation and, that as a citizen, conquering it is one of their prime responsibilities.

The Trap Is Set

Enoch R. Rust, *Second International Vice President in Charge of Safety, United Glass and Ceramic Workers of North America, AFL–CIO–CLC, Columbus, Ohio*

I am indeed happy to have this opportunity to contribute whatever possible to the alleviation of the growing need for increased safety alertness in the home, on the highways, and at play. I want to thank Mr. Thomas Berk, Safety Consultant for the Metropolitan Life Insurance Company, and others for making this appearance possible. I want to call my remarks, "The Trap Is Set."

In an audience with Pope Pius XII, I heard him say that travel is man's best means for an education. Since then I have learned this to be a true statement, especially where safety is concerned.

I have called my brief statement "The Trap Is Set," because when we hear of a person or persons meeting with a fatal accident, our first thought is carelessness. But this isn't necessarily the case in all situations.

On a sunny, bright, spring morning in the State of Alabama, a milk-truck driver pulled his huge truck off the highway in front of a store to make a delivery. The store being one of his regular customers he

repeated this maneuver regularly without any thought that on this particular morning he would be one of the mechanics of a traffic accident trap. The driver of a car coming up from the west did not realize that he was to be a party to this drama.

Like many mornings in the past, Mother asked little 8-year-old Sally to run across the street to the store and get a box of cereal for breakfast. On coming out of the store Sally walked behind the truck, paused a second, then leaped joyfully to the center of the street.

The trap was sprung. Wait a minute—something must have gone wrong. The driver heading east, being on the alert, looked through under the truck, saw two small feet and anticipated the little girl's next move. He slammed on his brakes; and by the time Sally had stopped in the center of the road, he had come to a halt—a safe 4 feet from Sally. Alertness prevented a would-be unavoidable accident.

The trap is set. A company having huge 60-foot storage bins decided to install a new conveyor which extended some 20 feet above the bins. The shop was instructed to do the job in as short a time as possible. In 24 hours the new conveyor was installed. In their haste, the 20-foot steel stairway leading up to the conveyor gear house was placed in position but never bolted down. The trap is set. A few days later, the paint shop assigned a painter to paint this stairway. Taking this assignment in stride—all in a day's work—the painter lay prone on the stairway and hung his head and shoulders over the edge so he could paint the bottom side. The shift in weight was just enough to turn the stairway over, and both the painter and the stairway plunged to the pavement 80 feet below. The trap was sprung. A man lay fatally injured. This accident tells us that speed is dangerous in areas other than traffic.

I believe it is long past time for us to begin highway, household, and community safety classes in high school. Yes, even prior to high school, credits should be given in the subject of safety. This would greatly contribute to a more safety-conscious tomorrow, which at our present rate of growth is one of our greatest necessities. We should learn that by invoking safety measures in our everyday activities we are not playing the part of a sissy. For instance, skindiving is a great sport and can be relatively safe, but when the great hero joins the club and disclaims all safety equipment as unnecessary or kid stuff, the trap is set and the entire club is in danger. Every once in a while they find one of these fellows where he was diving by himself. He learned too late that playing safe is not kid stuff.

I think, too, that just about everybody realizes the need for safety around the house, at play, and on the highways. The practice of

safety might cost us a little bit of time; but from traveling some 40,000 to 50,000 miles each year, I find that time spent on safety pays a greater dividend than any other investment we might make.

Youth organizations are doing a great job in teaching safety. The Boys Club of America, the Boy and Girl Scouts of America, Future Farmers, etc., are doing a good job. No doubt some of our best safety engineers emerge from these groups, but we can go further, we must reach every child and give him basic safety training.

Ladies and gentlemen, we live in a very complex society and the upcoming youngsters will not have as good a chance of survival as we, unless we make safety a part of their environment.

Let us dwell for a second or two on the chances of a 5-year-old who watches the daily news—every day. "A plane crash kills 58 persons." "Whole family wiped out in a two-car crash." "Man falls in bathtub and is seriously injured." These reports go on week in and week out. Can't you just imagine this youngster at the age of 16 after being exposed almost constantly to this type of news? He should be just about convinced by now that accidental death comes naturally.

This is where you and I come in. We are responsible for these youngsters, and we had better get started on a stepped-up program to see that junior also learns that many of these deaths are unnecessary and that they do not come naturally. We must start early to make safety a part of his environment.

I happened to see a letter concerning two auto accidents. The letter stated, in part, "Dear Sister and Brother, my Ricky, who just came home from the Navy, had a bad auto accident. His leg and arm were broken and most of his teeth were knocked out. I called a dentist to fix his mouth and the dentist was all set to start work on him after Christmas, but he was killed in an auto accident on Christmas Eve." The latter accident aroused my curiosity. At the first opportunity, I asked a few questions and found that it just happened. The drivers of both cars were sober. We might just call this one a rendezvous with fate.

Many people today take driving a car as a matter of fact and have all the confidence needed to put them right in the hospital. The irony of it is that they almost always take someone else along with them.

I believe we can safely say, there is no such thing as a perfect driver, that is to the extent that he is immune to traffic accidents, because we must always consider the driver of the other automobile. We must always be alert to this fact. As an example, let me relate an accident where the man that was killed might have been the world's best driver. We'll call him Mr. "X," and the other driver, Mr. "Z." Mr. "X" had just come through a tunnel onto a beautiful four-lane high-

way, with approximately a 20-foot median between the double lanes. After driving about 2 miles, he pulled off on the right-hand berm of his two lanes—maybe to look at a map or perhaps just to rest a bit. Mr. "Z," coming down the road in the opposite direction, lost control of his car. The car crossed over both the median and the two lanes and struck the parked car of Mr. "X." His injuries were fatal. We might also call this one a rendezvous with fate, but we must remember that somewhere along the line, human error had to enter the picture—failure to check tires, failure to check the steering, failure to get enough rest, etc. All of these are the mechanics in setting the trap.

I sincerely believe we are doing something about it, but we can and must do more.

Evaluation of Off-the-Job Safety Communication Program in the Western Electric Company, Inc.

VIRGIL J. MEYERS,[1] *Safety Director*

A scientist, physician, or businessman, finding himself confronted with a problem or question which cannot be answered on the basis of his personal experience, invariably turns to some authority for an answer. When the authorities have no answer, and the question is a vital one, research is initiated. Such an occurrence is the basis for what is to follow.

BACKGROUND

The Western Electric Company, in 1960, made full use of a newly developed central absence data computing system and thoroughly analyzed the absence records of the company's 150,000 employees. Suspicions based on former samplings of less detailed records were more than confirmed. Loss of man-days due to accidental injuries incurred while away from work was a multimillion dollar problem. Successive study of 1961's nonindustrial injury record indicated a loss of 77,000 employee-days, with resultant direct expense approximating $1.25 million. Estimated additional indirect costs such as loss of production efficiency, related administrative expense, and visiting nurse service brought the total annual dollar drain attributable to nonwork injuries to more than $6 million.

Aware of the scope of the problem, Western Electric's top management was fully receptive to the proposal of a comprehensive off-the-job safety education program.

[1] Mr. Meyers' presentation was made with the use of slides to highlight his message. He has recast data included on the slides for purposes of these proceedings.

THE PROGRAM

Launched in January 1962, Western Electric's program, "Working Together for Safe Living" was based on a format of integrated employee communications.

All available media—the written word, the spoken word, visual aids, and the shared word—were aimed at the employee in an attempt to rifle-in the message of safe living. Four elements proved basic to a program such as this were fully employed:

Motivation

We had to demonstrate to the employee that a problem exists, that the problem is his, that he is the potential loser and, in the end result, only he can solve the problem.

Guidance

The employee had to be furnished with specific knowledge to aid him in preventing accidents.

Recognition

Employee groups demonstrating achievements in accident prevention or the promotion of safety have been receiving recognition and rewards for their efforts.

Repetition

Communications involving motivation, guidance, and recognition have been constant and repetitive.

Western Electric's off-the-job safety program was made available for voluntary consumption by the company's 13 major manufacturing plants, their satellite shops, 35 distributing houses, field personnel in installation areas throughout the country, defense activities personnel, three subsidiaries and corporate headquarters in New York City. The program, as conceived, provides for timely presentation of safety education on specific subjects through monthly group discussion meetings led by first-line supervisors in which employee discussions about safety hazards and accident prevention were stimulated by the use of illustrated flip charts. News photo bulletins were posted in work areas, illustrating the consequences of unsafe practices; humorous picture posters, citing specific axioms of safe living, were also used. Safety-oriented items in companywide and local employee publications, including safety cartoons, editorials, and reports on progress and results of safety campaigns were presumed to have received a large audience.

Motion pictures were shown, and booklets giving advice on specific topics such as water safety, poisons and antidotes, and winter driving were widely distributed. In addition, several local safety supervisors modified or expanded the off-the-job safety program to include additional motion pictures, safety carnivals, auto inspections, and safety reminders which were mailed to the employee's home or inserted in his pay envelope.

As anticipated, the formulated safety program was adopted by the company locations in varying degrees—from using the printed media only to the complete program with additional embellishments. Altogether, an immeasurably great amount of time, effort, and money was expended during the first 2 years of the program's existence.

We did not expect dramatic results. Experience of other companies indicated that significant results in off-the-job accident prevention were not manifested until their program had been applied for a full 5 years. We were, however, concerned about the effectiveness of our program in terms of time and effort expended, as well as potential accidents that could be prevented. Willingness to spend money to save lives and prevent injuries is an integral part of Western Electric's safety policy, but no business can afford to maintain activity in any endeavor without having proven results to justify the expenditure.

Was our planning paying off and were we accomplishing our goals? What was the employee's reaction?

In order to obtain an objective appraisal of our off-the-job safety program and its results, it was decided to engage an outside firm of consulting industrial psychologists.

THE SURVEY

The logical first step in this introspective operation was to define a limited number of specific objectives. First, we wanted to measure the effectiveness of the program in improving off-the-job safety awareness of the employee and his supervisor. Second, we wanted to know which elements of the program most efficiently served their purpose and which portions did not produce a fair return on the investment. The overall and most important objective was to furnish conclusive data upon which management could base decisions on the future of the program.

Specifically sought were data comparing safety awareness of employees exposed to the program and those who were not; comparison of the effect of various media in influencing employee safety awareness; general employee attitudes toward the program; and specific recommendations on increasing the effectiveness of the program.

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Hourly and salaried employees of six Western Electric locations were randomly chosen to be subjects of the survey. One hundred employees and 5 first-line supervisors were selected at each of four manufacturing plants, and 50 employees and 3 supervisors at each distributing house. Of the four plants and two houses participating in the survey, two plants and one house had exposed their employees to substantially the entire program, while the employees in the other two plants and house received less exposure or none at all.

SURVEY METHODS

All participating employees and supervisors were promised complete anonymity throughout the several phases of the survey as described here.

An opinion gathering technique, used extensively in many facets of this survey, utilized the projective psychological mechanism of identification. The employee or supervisor being interviewed was not "put on the spot" but was usually asked, "What do you think other employees' opinions about this would be?"

Opinion Poll

All employees involved in the survey were given a series of 20 multiple-choice questions directly inquiring into attitudes on the program, attitudes on the importance of nonindustrial safety and evaluation of the off-the-job safety program. These employees, upon completion of the opinion poll, were also invited to submit any additional related comments they wished to volunteer.

Thematic Questionnaire

A sampling of 50 employees was chosen, 25 from each of the two plants most representative of those with maximum and minimum exposure. These 50 employees, in individual interviews, were shown five sketched pictures of situations involving safety or accidents and were asked in prearranged, specific questions to describe their interpretations of the scenes depicted. This was used as an indirect method of gaining knowledge about employee attitudes toward safety, the company, and his own personal relationship with the two.

Directed Interview

Twenty-five percent of the 500 employees taking the opinion poll were randomly chosen in proportionately representative groups for the purpose of individual depth interviews. Although the discussion in

the interview was stimulated by a series of leading questions, "yes" or "no" answers were not required and all qualified answers were noted for consideration in their specific context.

Supervisor Interviews

The final phase of the survey was the informal interviewing of the 26 selected supervisors to delve into their feelings on safety, into the general effectiveness of the company program, and into the supervisor's role as group discussion leader.

SURVEY RESULTS

In the interest of brevity, we will examine only highlights—results that we found to have significance in evaluating Western Electric's off-the-job safety program.

Opinion Poll Findings

The most noticeable result of the opinion poll was that the reaction of the groups most exposed and least exposed to the program did not differ significantly except on questions directly relating to exposure to the program. The findings were interpreted to indicate a uniformly high safety awarness. Over 80 percent of the respondents thought the program was meaningful, and more than 90 percent thought that adherence to off-the-job safe living would appreciably influence employee work attendance. Almost all felt the company should be interested in employees' after-hours safety, while only a very few indicated resentment of company interest in their personal affairs. While the necessity of safe living was generally acknowledged, many felt that just the knowledge of safety was sufficient protection from accidents. An apparent lack of original thought was found on the subject of safety. Habitual adherence to learned safety rules predominated, e.g., "Keep medicines out of children's reach," but the theories behind these safety rules were not carried over and applied to similar circumstances, such as keeping other dangerous items like turpentine and kerosene away from children. Another significant finding was that most employees would apparently be willing to accept blame for an accident.

In comparing the two groups, most and least exposed to the program, one striking difference came from the survey of spontaneous comments submitted with the multiple-choice opinion poll. The employees receiving maximum exposure to the program submitted more than half again the number of voluntary comments as the other group. In general, these comments requested more exposure to the safety pro-

gram, especially motion pictures. Interestingly, those more exposed to the program submitted the most requests for expansion of the program. Another comment frequently volunteered by the most exposed group was criticism of the quality of the group discussion leader's performance. Unpreparedness, insincerity, and lack of spontaneity were the most frequently voiced criticisms.

Thematic Questionnaire Findings

The 50 lists of responses to the thematic (picture-association) questionnaire were coded and submitted to a team of psychologists for classification into degrees of safety consciousness. Those who ranked the questionnaires had no way of knowing which were the most or least exposed groups. Following ranking into four categories, the questionnaires were decoded, and the results were as follows:

	Safety consciousness			
Group	*High*	*Above average*	*Marginal*	*Low*
Most Exposed	2	13	4	6
Least Exposed	0	8	14	3

Conclusions drawn from a breakdown of rankings in each of several related topics indicated that safety training tended also to improve seriousness of attitude toward safety, to foster willingness to accept blame for accidents, and to increase an attitude of self-protection or safe behavior. The exposed group showed a definite superiority in having specific off-the-job safety knowledge.

General interpretations of the questionnaires by the psychologists indicated an overall intellectual knowledge of safe practices, a positive feeling toward safety, but a tendency to lack motivation or emotional involvement as related to accident prevention. Many indicated a willingness to follow specific safety rules to the extent that they seemed almost eager to have an authority order them to "do this" and "don't do that." Implicit with this was a lack of willingness to become involved in the rationality of cause and effect safety self-education.

Directed Interview Findings

This portion of the survey, involving 124 employees, explored the effect of the various media used in the off-the-job safety program and also tested specific knowledge of safe and unsafe practices.

The group with maximum exposure, as would be expected, could recall a greater number of training aids. Significantly, however, it was found that they could recall in greater detail the aids they had observed, compared to those in the least exposed group who had, on

the whole, only vague recollections of the safety promotional material they had seen.

The conclusion was also drawn that the media which left the most lasting impression were those types of communications which emotionally involved the individual: motion pictures, photo bulletins, safety displays, and group meetings in which the individual could participate. In other words, the employee remembered those things of which he could readily become a part, or with which he could easily identify himself.

The least effective media were cartoon posters, cartoons printed in local employee newspapers, articles in the company magazine, pamphlets, bulletins mailed to the home, and single sheet handouts.

As should be expected, respondents in the most exposed group indicated a substantially greater familarity with the company's off-the-job safety program. The least exposed group almost unanimously acknowledged the existence of such a program and agreed that it is a good idea. As far as the specifics of accident prevention are concerned, the employees more exposed to the program indicated a generally higher degree of knowledge than those less exposed. The more exposed group also showed a greater degree of safety responsibility, had stronger feeling that the company was conducting the program for the employees' welfare, and had more pride in the safety program.

Supervisory Interview Findings

Because first-line supervisors were chosen as group leaders in our program on the basis of their established rapport with the employees, their role of authority, and their qualities of leadership, it was felt necessary to sample their attitudes—a factor upon which the success of a portion of the program depended. Using indirect, projective interviewing techniques, the following was found to be a revealing insight into an important link of the program.

Supervisors were found to be very sensitive to the presumed attitudes of the top plant management. Several presuming antipathy on the part of management toward the off-the-job safety program, eased their efforts along these lines. Many supervisors felt uneasy about their roles as group discussion leaders, because they had limited opportunity for preparation and thus had little confidence in their ability to lead discussions on a topic foreign to them.

TO THE FUTURE

We, at Western Electric, who have taken part in our off-the-job safety program have received a great deal of gratification from this survey. We have learned that our efforts have contributed toward a

safer group of employees. But more important, we have learned where mistakes or miscalculations have been made. We have learned how to strengthen our program to provide for greater effectiveness of operation and a greater number of accidents prevented.

In the future, our program will place more emphasis on personal presentations involving the employee. We will continue to use photo bulletins and safety displays, but will discontinue the use of cartoons, posters, home mailings, and handouts. We intend to reexamine the preparation of group discussion leaders, and we will try to develop safety material that will have appeal to employees within their specific locality.

We will strongly advocate and sponsor group meetings with individual participation, as well as urge the continuance of safety fairs and inspections. In short, we have been given expert advice; we have been shown how to do an important job well.

Our late President, John F. Kennedy, said, "One man can make the difference—and every man should try!" If through our guided efforts we can make the difference, it certainly will be worth the try.

What Do Off-Job Accidents Cost Industry?

William E. Fields, *Manager, Safety and Security Services, Space Guidance Center, International Business Machines Corp., Owego, N.Y.*

I appreciate this opportunity to discuss the cost of off-job accidents and to share our experiences with you. During this presentation, I will talk about the National Safety Council's and the U.S. Public Health Service's nonwork related accident facts: (a) These facts are then projected to industry; (b) we will take a look at one industrial facility's actual experience; (c) if actual experience substantiates information as published, you may quickly estimate your own work accident cost; and lastly (d) what generates cost and how information can be collected.

It might be well to define some terms that will be used. "Off-the-job accident" is an accident to a worker which occurs away from his job. A "nonwork accident" is an accident to any person (including children, mothers, retired people) and also includes off-the-job accidents to workers. The word "accident," as generally used, is one which results in an injury that costs at least one full day's time beyond the day of the accident. I will use the word "injury" to describe a situation that required some medical attention to a person or that cut down on his usual activities for a whole day (National Health Survey).

We might ask ourselves "Why should we spend time and money to investigate the results of nonwork accidents?" One of the main reasons is that we really don't know a great deal about such accidents, their dollar cost and their influence upon society. It is good business judgment to make an appraisal of the cost to industry of accidents suffered by the employee and his dependents. Additionally, it appears that the area of nonwork related accidents, according to all available information, offers the greatest return on the investment.

The information I have was compiled by the National Safety Council (NSC) and the U.S. Public Health Service.

As a result of looking into the costs of nonwork accidents, I am shocked and I am beginning to realize and to appreciate, for the first time the total costs in dollars, and in suffering, the drain on the economy, and of their resulting adverse effects. I find it difficult to understand how any rational person can be apprised of the costs of nonwork accidents and not take positive action.

In order to develop an appreciation for the problem at hand, I feel I must refer to several statistics. I will try to present this data as clearly and interestingly as possible.

1962 National Safety Council Data

	Fatalities	*Injury*	*Rate per 100,000*
Industry	13, 700	2, 000, 000	21
Off-job	83, 300	7, 800, 000	4, 200
Total	97, 000	9, 800, 000	

Worker accidents off the job

Fatalities	*Injury*	*Rate per 100,000*
30,000	2, 250, 000	46

According to the NSC, home accidents claimed the lives of 28,500 people, and 4,300,000 people suffered disabling injuries. The death rate per 100,000 comes out to 15.3. This injury total of 4,300,000 tells us that 1 person in 43 in the United States was disabled 1 or more days by injuries received in home accidents in 1962. About 110,000 of these unfortunate people are suffering some permanent impairment.

Anticipated Nonwork Disabling Injuries—National Safety Council

[Total injuries 7,800,000 vs. 185,000,000 population=1 injury for each 23 people and 1 in 28 of these injuries will be permanent impairment]

Employees	*Total*	*Ratio*	*Injury*	*Ratio*	*Permanent impairment*
$80,000 \times 4 =$	320, 000	1 to 23	13, 913	1 to 28	500
$14,500 \times 4 =$	58, 000	1 to 23	2, 520	1 to 28	110
$4,000 \times 4 =$	16, 000	1 to 23	694	1 to 28	30

The U.S. Public Health Service, based on surveys conducted annually, estimated that on the average 38,100,000 nonwork injuries that require medical attention occur yearly. (You will notice these are injuries.) Let us assume that the population of the United States during 1962 was 185 million. We can expect 4.8 people to have one accident during a 12-month period. This population figure may appear high to you. The actual population excluding visitors was about 183 million.

If we should relate the above accident ratio of the U.S. Public Health Service and the NSC to a typical American corporation, we can expect members of the corporation's family to suffer injuries in a 12-month period as outlined below:

Anticipated Nonwork Disabling Injuries to employees and their families assumin four members per family (3.71—1962 U.S. average) per U.S. Public Health Service

Employees	*Total*	*Ratio*	*Accidents*
80, 000 x 4=	320, 000	1 to 4.8	66, 666
14, 500 x 4=	58, 000	1 to 4.8	12, 000
4, 000 x 4=	16, 000	1 to 4.8	3, 333

Some of the rates and figures just mentioned are startling. My first reaction was that they could not possibly be true. I thought there must be a mistake in calculation. It sounded completely unreasonable to me that a company employing 4,000 people could expect 3,333 nonwork related accidents in a year.

Further investigation forced me to change my mind. I found that accidents claimed more lives of children, ages 1 through 14, than the five leading diseases. The accident death rate for youths 15 through 24 is even more gruesome. Accidents in this age bracket cause more deaths than all other causes combined. It is a matter of record that accidents take 6½ times more lives than the next highest cause, which is cancer.

I still wasn't convinced, so I made a little survey closer to home—some employees in my project. This informal check revealed that 37 employees with an average of 4.27 members per family had 26 accidents during the past 12 months. Based on the national ratio of about 1 accident per 4.8 people, we should have had 16.6 accidents. Needless to say, I was quite surprised and somewhat ashamed of the Safety and Security Services organization. I am afraid though that I lead the list with a family of five having two broken bones and miscellaneous other less serious situations.

Apparently, more and more industries, State, county, and city governments are becoming aware of the costs of off-the-job accidents. Recently, the city of Chicago was surprised by a study made of traffic

accidents during 1958. This study was made by the State Highway Division in cooperation with the Federal Bureau of Public Roads. The real shocker came when it was found that automobile accidents in Chicago were costing $115,460,000 and not $60 million per year. The actual costs were about double the previous estimates. This study also revealed that 67 percent of the total accidents recorded represented 47 percent of the total cost. When this information was publicized, the city fathers and the common citizens began to realize why residents of adjoining DuPage County were paying only 66.2 percent of the premiums that Chicago residents were paying for their automobile insurance. Citizens were even more perturbed when they discovered that their neighbors in suburban Cook County were paying only 78.1 percent of the insurance costs of a Chicago car owner.

Now that we have looked at some of the accident rates for the Nation as a whole, let us see what happened in a 4,000-man industrial facility.

	Accidents	*Hours cost*	*Family Medical and Major Medical cost*	*Total cost*
1961:				
Employee	88	$100, 310	$13, 182	---------
Family	102	4, 080	16, 731	---------
Total	190	104, 390	29, 913	$134, 303
1962:				
Employee	115	100, 275	13, 048	---------
Family	294	11, 760	19, 158	---------
Total	409	112, 035	32, 206	144, 241
1963:				
Employee	110	81, 500	11, 315	---------
Family	519	20, 760	22, 298	---------
Total	629	102, 260	33, 613	135, 873

The National Safety Council estimates the cost of off-the-job accidents to the employee and his employer to be $100 per employee per year. Many companies pay approximately 70 percent of this cost. Based on this estimate, this would cost the plant (4,000 × $70) $280,000 per year.

In order to make the NSC estimate even more conservative, let us throw in the expense of all nonwork accidents. Costs would then look like this:

Employees	*$100*	*$50*	*$25*
80,000	$8, 000, 000	$4, 000, 000	$2, 000, 000
14,500	1, 450, 000	725, 000	362, 500
4,000	400, 000	200, 000	100, 000

Let us assume that the factory's costs are only 50 percent or $140,000 per year. If the facility should operate on a margin of 5 percent, the

$140,000 loss wipes out the profits on sales of $2,800,000. This loss would wipe out a 7-percent profit on $2 million in sales.

You may choose the total that best suits your experience and thinking. I seriously doubt that many of us are four times better than the national average.

I think that we have shown that there is a cost associated with nonwork accidents. In order to recognize costs, we must define those reactions to an accident that generate costs. Such costs can be defined as both direct and indirect. I would define a direct cost as one that is a direct result of the accident and the sum of which can be quite easily computed. An indirect cost is one that would adversely affect the community, the company, and the employees, socially and economically.

For purposes of this discussion, I have placed the following in the *direct* cost category:

a. Salary paid during absence.
b. Lost production (production worker, salesman, or customer engineer).
c. Company medical expenses.
d. Administrative costs of finding or hiring a replacement worker.
e. Salary costs of supervisory time required to locate and train replacement.
f. Any spoiled product, tool, material, etc., as a result of accident, or scrap by less competent personnel replacement.
g. Salary and other expenses of supervisor or other employees and associated expenses of visiting the injured, attending funeral, etc.
h. Medical and hospitalization benefits plan costs.

There may be other direct costs that I have not enumerated. Salary paid a worker during his absence as a result of an accident can be directly attributed to accident costs. Lost production, I believe, can be computed quite easily. If the man is a direct worker, the correct figure to use is the value added to the item on which he works. The lost services of a salesman, or a company's technical representative can be computed. A sizable portion of a company's medical expenses are generated as a result of nonwork accidents. We must take into consideration the time the worker spends in going to and from the medical department, the time of the medical personnel consumed, all supplies, and a portion of the occupancy expenses. The costs of finding or hiring a replacement worker can be easily identified. Other direct costs such as the time the supervisor spends on the problem and spoiled products and materials wasted are very easily identified and can be

accounted for through the application of relatively simple accounting procedures.

Some *indirect* costs are:

a. Increased tax and welfare costs.
b. Employee's peace of mind.
c. Morale, efficiency, and production of other workers.
d. Customer relations.
e. Community relations.
f. Higher insurance costs.
g. Dilution of management effort.

Indirect costs are much harder to identify and to ascertain an exact value. Any accident may have far-reaching and complex effects. The victim may be faced with medical and hospital bills not fully covered by insurance. By the time these are paid, he may have nothing left to pay for other things such as taxes and mortgage payments. If his resources are entirely depleted and he has to seek financial help, he may become an economic liability to his community. His children may not receive the planned-for education. A college degree, as you know, means several hundred thousand dollars in extra income to an individual. Thus, the victim of an accident can become, instead of an asset to a community, a serious liability and a drain on the resources of the area. Through various taxes, individuals and companies support all levels of government and its services; many of these services are overburdened and understaffed. If nonwork accident occurrence could be reduced, the requirements of tax-supported hospitals and welfare departments could be decreased.

The personal costs to the injured are sometimes beyond measure. However, it is likely that the greater impact is in the form of mental anguish. This often is as serious as physical pain or impairment in reducing the job efficiency and well-being of the injured employee. Emotional balance is essential to mental alertness and efficiency on the job. Thus, worry and anxiety can rapidly lead the victim down the road to neglect and efficiency. At that point, we have a serious personnel problem. I have seen such situations and I am sure that most of you have witnessed such cases. An injury to a salesman, technical service personnel, technical representative, buyer, or other key personnel can seriously impair customer relations. As we know, it is difficult for a new person to step into a job of such importance and pick up not only job detail but also the decorum that has been established with our customers.

Most companies place a great deal of emphasis on the company image. Much of the advertising that we see is directed not towards selling an item but establishing in the mind of the consumer a favor-

able image. I know of nothing that can damage community relations with more devastating effect than a series of serious accidents. As you know, the neighbors of our various facilities say that we are the world's fastest and worst drivers.

I have placed higher insurance rates under the indirect category. This point may be debated. As demonstrated by the experience of Chicago's suburban Cook County, it is certainly true that higher rates for automobile, fire, and public liability, as well as medical and hospital insurance, can be regarded in part as additional costs resulting from nonwork accidents. This is brought home rather forcibly to you who have male drivers in the family under 25 years of age.

One of the most important parts of a nonwork accident program is fact finding, and recording routine and accurate data. Through analysis of the data, the magnitude of the company's problem can be ascertained, and the type of accidents on which attention should be focused can be identified. Industry today uses various methods and sources for obtaining accurate information.

One of the most profitable sources is an absence report. Practically every organization has some type of absence-reporting system. Companies that use data processing equipment usually code the absence on a timecard. Some companies require a form submitted by the first line supervisor. In all cases, absenteeism is usually accumulated by the payroll and personnel departments. One needs to know of all absenteeism resulting from off-the-job accidents. Additionally, one needs to know the total absenteeism of a person due to an injury to a member of his immediate dependent family. Once these names are available, one is in a position to secure additional data such as hospital and medical benefit costs, production loss, resultant overtime, etc.

Any system designed to collect this data must be as automatic and simple as possible. It cannot place a burden on the first-line supervisor and neither can it give the employee the impression that the information required is motivated by paternalism or a nosy supervisor or safety department.

Records of nonwork accidents should be uniform and complete. A suggested form is appended on p. 280 that could be adapted to the needs of most facilities. Such a form used to gather information should include: name of person injured; age; address; department assigned; relationship of injured employee; date of accident; nature of injuries; part of body injured; date of first full day lost from work; date of return to work; actual hours lost; and a brief description of the accident.

I recommend that the National Safety Council's "Reportable Injuries Breakdown" be used. This would insure uniformity among

industry and allow reporting to the National Safety Council. A monthly and quarterly summary should be prepared. These summaries would allow an evaluation to be made of nonwork accident experience. Dollar costs can then be compared to off-the-job expenses. This form is designed for off-job accidents as well as nonwork accidents.

I believe it is very desirable to establish a standard method of measuring off-the-job accident experience if reliable conclusions are to be drawn. I do not think we need, at present, to establish rates for nonwork accidents. The off-the-job frequency formula is based on 312 exposure hours per employee per month. This amount is arrived at in this way.

Normally an employee works 8 hours a day, 5 days a week. If 8 hours a day for sleeping are excluded, there remain 8 hours a day or 40 hours during the workweek in which the employee is exposed to injury off the job. In addition, he has 2 days each weekend of 16 exposure hours each. These 72 exposure hours per week multiplied by $4\frac{1}{3}$ weeks per month total 312 exposure hours per employee per month. No adjustment need be made for overtime since it will be offset by holidays, vacations, and incidental absences.

The off-the-job (OTJ) frequency rate is therefore computed as follows:

$$\frac{\text{Number of OTJ injuries} \times 1{,}000{,}000}{312 \times \text{Number of employees}} = \text{OTJ frequency rate}$$

For example, a plant with 10,000 employees has five off-the-job injuries during March, each causing 1 day of absence from work. The off-the-job frequency rate for the month will be:

$$\frac{5 \times 1{,}000{,}000}{312 \times 10{,}000} = 1.60$$

Reporting Standards Resemble on the Job

To be classified as reportable, an off-the-job injury must be the result of an employee losing one or more full working days or being unable to work on one or more nonscheduled workdays. No medical opinion is needed. Fatal or permanent injuries are to be included.

Off-the-job injuries are classified in three categories: transportation, home, and public.

Transportation injuries are those caused by or resulting from accidents involving an automobile, truck, bicycle, bus, streetcar, motorcycle, airplane, railroad, boat, or other form of transportation. Pedestrian traffic injuries are also included here.

Home injuries are those incurred in the home or home-yard area and are caused by firearms, machinery, tools, fire, explosion, exposure (heat or cold), electricity, toxic material, falls, slips, improper lifting, hot objects or material, sharp objects, objects striking, overexertion, animal, insect or other causes.

Public injuries are all those other than transportation injuries which occur at locations other than home or industry.

The number of man-days lost is the total number of calendar days lost from work plus all intervening holidays, vacations, and other nonscheduled time during which the employee is unable to work because of his injury. If accident and death occur on the same day, no day is lost. If death from an accident is delayed, the number of days lost up to the time of death is included.

It should be noted that schedule charges for permanent-partial disabilities or fatalities, used in computation of time lost from occupational injuries, are *not* applied to off-the-job injuries.

After the facts on off-the-job accidents have been gathered and arranged in orderly fashion, the next step is to analyze them for types of injuries, causes, and frequency so that the off-the-job safety program can be tailored to meet specific needs. Supplemental guidance as to where special emphasis should be placed in program planning can often be furnished by local conditions. The location of the plant site, its environment, and the special interests of employee groups, such as skiing, boating, cave exploring, or hunting, are factors which can help in selection of topics and activities.

A good topical breakdown provides a solid structural framework around which the off-the-job safety program can be shaped. A breakdown can be made on the basis of the seasons and their attendant hazards; in terms of home, traffic, and public accident problems; and according to accident types and causes.

One factory with which I am acquainted sends a form to each manager having an employee absent because of personal illness or off-the-job accident. The manager completes this form and sends it back to the safety department, where it is analyzed and summaries made on a monthly and yearly basis. During the first 8 months of 1963, off-the-job frequency ratio was 8½ to 1. The severity rate for off-the-job as compared to on-the-job was 2.5 to 1 and days lost was 5 to 1. Not only does the safety department have this information but it knows if the accidents are home, transportation or public ones. The safety department is in a position to direct its off-the-job accident program toward areas that are the most severe. With this information, I believe, the plant is in a position to establish firm dollar costs for presentation to management.

As a result of this study, I learned a few important things:

a. Off-the-job injuries are much higher than work injuries among the same workers.

b. We know that everyone needs the benefit of an off-the-job safety program.

c. Relatively few companies are doing a thorough job of collecting and analyzing data and then carrying on a good nonwork related program.

d. There are virtually unlimited opportunities for off-the-job safety. Taking advantage of these opportunities will pay tremendous dividends not only from a humanitarian viewpoint but in terms of good business. It is also good business for all of us to do what we can to reduce the $7-billion burden caused by accidents that is reflected in the cost of our products.

e. Off-the-job safety needs to be an integral part of industry's on-the-job safety program.

f. History shows that effort pays dividends both on and off the job. The reason the off-job total is not greater is the effect that industrial safety training has had.

g. Off-the-job safety is beneficial to all citizens.

Consider what this built-in cost of doing business means when we place our products on domestic or foreign markets. It has been stated by high officials in government that we must improve our export posture. It seems that the elimination of this unnecessary expense could help hold our price line and enable us to attain and increase our share of the world markets. I am firmly convinced that the cost of off-the-job accidents can be decreased. I believe this reduction could be as much as 50 percent. Additionally, I believe this is a job for industry. We all complain about government encroachment on our private lives and into management of corporations. Management of American industry has a tremendous opportunity to take the initiative and perform a service to our citizens that will be worth billions of dollars; and more important, will eliminate untold suffering and heartbreak.

What action will you take?

EXHIBIT I

XYZ PLANT

SUPERVISOR'S NONINDUSTRIAL ACCIDENT REPORT

Employee ---- Dependent ----
Name of employee ---------------- Serial No. ---------- Dept. ----------
Name of Dependent ---------------------- Relation to employee ----------
Age of injured ---------- Date of accident --------------------------------
Did accident require doctor's care? ------
Did accident require hospitalization? ------
Did employee lose time due to accident? ------ Total hours ---------- Total days ----------
Will there be permanent disability? ------ Did accident cause death? ------
Description of accident --

Transportation ------ Home ------ Public ------

Type of Injury:		Part Injured:	
Laceration	----	Head	----
Bruise	----	Arm	----
Puncture	----	Body	----
Burn	----	Back	----
Fracture	----	Fingers	----
Strain	----	Foot	----
Infection	----	Eyes	----
Skin	----	Toes	----
		Leg	----

MARIE SCOTTI, *Manager, Communication Services, Maxwell House Division of General Foods Corp., Hoboken, N.J.*

I regard it a pleasure and a privilege to take part in the President's Conference on Occupational Safety. Off-the-job accident prevention has, for a long time, held a very high priority among my interests.

I have with me some slides used recently at a Personnel Managers' Conference. The task that befell me was that of an individual who had to sell an intangible product to a not too receptive audience. You will notice the reliance on humor and visual stimulation. This type presentation was necessary to sustain interest long enough for some positive safety propaganda. It makes the inappropriate stimulus worthwhile. (Slides were shown.)

I want to discuss an aspect of accident prevention that is becoming more important day by day, year by year. That is *safety for profit.*

Recently, General Foods Chairman Charles G. Mortimer amply stated that the corporation's two sources of profit come from within and without.

The cost of on- and off-the-job accidents seriously impedes the profits from within. Nearly $5 million Maxwell House sales are needed to pay for the direct costs of on- and off-the-job accidents for the year 1963. Of the $5 million, $275,000 represents off-the-job. There were 2,400,000 pounds of coffee production lost because of days lost from work due to off- and on-the-job injuries in 1963. Of the 2,400,000 pounds, 1,085,040 pounds were lost due to off-the-job injuries.

At Maxwell House and General Foods we are eagerly engaged in a search for profits—a way to increase the return on our capital invested. *Accidents are a direct drain on profits.* Accidents are important to cost cutting and to profit development because, unlike many other costs of doing business, they can be reduced or at least prevented from climbing. They are unique in this respect. Take a look at your costs of doing business: cost of raw product, the costs of new equipment and machines, the costs of labor. How many of these show any promise for cost reduction, except as you may be able to introduce laborsaving devices which may result in decreased numbers of people employed? I don't think anyone here expects wages themselves to go down nor the price of raw material to diminish in the foreseeable future. But accident costs are not in this category. We know, in our own company and you know in yours, that through progressive safety programs and safety measures, accident costs can be reduced if not entirely eliminated.

This emphasis on costs and profits as related to safety is in no way intended to minimize the humanitarian aspects of accident prevention. This is still our most important consideration—the prevention of loss of life and limb; the elimination of pain and human suffering, and the evidence of the deprivation of families through the temporary or permanent loss of their breadwinners.

Such a subject might also be more appealing since most of us are or should be emotionally involved in the sacrifices of ourselves and our fellowmen. The fact that we will not dwell on them here does not diminish their importance.

Let's talk about how much off-the-job accidents really do cost. I'm not going to burden you with a heavy treatment of statistics—if you're like most people, you don't get too excited over figures. So please don't close your minds; I only want to give you a few significant facts.

The National Safety Council's *Accident Facts* estimates that in 1963, nearly 7 out of 10 deaths and more than half of the injuries occurred off the job. In 1963, workers injured off the job lost a total of 50 million man-days compared with 40 million man-days lost by workers injured on the job. So much for national figures. Much more significant to you and to me is: How much is the accident bill

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in our own company? Do you actually know what your accident costs were this year, last year, the year before, or what you can expect next year?

Probably, you know with reasonable accuracy—if you keep any kind of records—how much you're spending for workmen's compensation, whether you are privately insured or insured through State funds, or self-insured. Probably, most of you also know what your medical costs are for accidents. These so-called direct or insured costs of accidents are easily measured.

In April 1961, Maxwell House started to record the number of off-the-job injuries in the division for its four plants. In these records were tabulated:

—The number of injuries by plant location.

—The frequency and severity rates.

—Where the accident happened, i.e., in transportation, in the home, or in public.

—And what act was involved, i.e., driver, passenger, pedestrian, sport, slip, fall, lifting, struck, electricity, and so on.

It should be noted that 28 Maxwell House sales districts began their reporting of off-the-job injuries in September 1963. This group took a little longer to sell.

It wasn't long before we discovered we had about three times as many off-the-job injuries at Maxwell House as we did on-the-job injuries. (Slides were shown.)

The cost of off-the-job injuries.

Once every 4½ hours an employee had an off-job accident that resulted in loss of time from work.

Once every 7½ hours an employee suffered a lost-time accident on the job.

For one lost-time accident on the job, there were about three lost-time accidents off the job.

Off-the-Job Injuries—1963

Direct costs	$31,953.52
MH sales needed	271,600.00

Location	Frequency rate		Days lost	
	Off-job	*On-job*	*Off-job*	*On-job*
Hoboken	6.4	3.9	467	660
Houston	20.6	1.5	626	142
Jacksonville	10.7	0.0	203	00
San Leandro	10.8	5.7	205	761
Sales	3.8	8.8	6	179
Total	10.2	3.9	1,507	1,742

Injuries by Location

	Transportation		Home		Public		Total
	No.	Cost	No.	Cost	No.	Cost	cost
Hoboken	10	$1,714.15	17	$2,203.78	8	$1,727.48	$5,645.41
Houston	14	5,614.10	17	3,723.71	12	7,962.00	17,299.81
Jacksonville	5	2,038.44	8	1,558.08	3	1,930.80	5,527.32
San Leandro	5	916.60	6	1,658.34	3	774.04	3,348.98
Sales	0	00.00	0	00.00	2	132.00	132.00
Total	34	10,283.29	48	9,143.91	28	12,526.32	31,953.52

Analysis by Cause

	Costs	Number of cases	Days of disability
Automobiles	$10,283.26	34	575
Falls, slips	7,108.27	31	398
Sports	5,877.20	8	154
Fight, assault	3,221.76	8	112
Improper lifting	1,491.84	7	76
Struck by object	669.52	7	36
Sharp object	1,921.23	6	65
Animals, insects	557.35	3	33
All others	823.09	6	58
Total	31,953.52	110	1,507

Cost per case: $290.49 as against $282.25 for year 1962—increase of $8.24 per case. Progress is being made with the Maxwell House off-the-job program. Reporting is better. We're beginning to get an idea of costs. But there is still a great deal to be done. I have heard much wailing and gnashing of teeth by safety people because they cannot get top management support behind their on- and off-the-job programs; and it is for this reason that safety activities were falling down or failing in the company. I assure you, if you can show your management that your safety programs, your accident prevention activities, can turn up dollars on the P. & L. sheet, you will have not only an interested listener, but an insistent listener and one who insists upon action being taken to capture these dollars.

Remember that numbers like 200, 300, and 400 have little meaning to most business executives, but figures like $200, $300, and $400 really talk. They know exactly what you mean.

R. B. TUTTLE, *Division Plant Manager, New Jersey Bell Telephone Company, Jersey City, N.J.*

In putting together my material for today, it occurred to me that a discussion of off-duty accident statistics in a conference of this size and scope would probably be an exercise in redundancy. I have

resolved, therefore, to talk about the management of safety and to leave the presentation of statistics to those who are more knowledgeable in the field than I.

As a matter of fact, I think we hurt our safety programs at times by being somewhat overzealous in the application of bare statistics.

For example, we have been publishing rather stark figures for years in our effort to combat the appalling number of motor-vehicle accidents in this country. Apparently, most people accept fatalities of about 40,000 per year as the norm simply because of the repetition of the numbers. They are bored by the automobile accident box scores printed on the front page of our newspapers, or the occasional article in a magazine deploring the upward trend of accidents. They are unimpressed by tabulation—until they become an accident statistic. Then, of course, it is too late except, perhaps, for the curious who wish to note where their individual number appears in a column of figures.

I do not mean to imply that statistics and records not not have an important part to play in a program for reducing accidents, because most certainly they do. I do contend, however, that they should be used primarily for making an analysis of the problem and to aid in its solution, as I shall develop shortly.

It has been my experience that poor off-duty accident performance, as compared to on duty, is largely the result of a lack of understanding on the part of management. This has nothing to do with the feeling of compassion for a fellow who has been laid up as a result of an off-duty mishap. Rather, I am referring to the peculiar lack of recognition of responsibility on the part of some management people for employees injured off the job. Somehow, it would seem, costs and job performance are not affected by absence due to off-duty accidents.

It appears to me that we are not going to improve the ratio of off-duty to on-duty accidents until we as managers become concerned with injuries to our employees, regardless of whether they occur on or off the job.

We have not made much progress towards improving this ratio because we just have not put our minds to the task. We have not made it clear to those who are in the best position to motivate, that is the middle manager, what off-duty accidents really cost him in his endeavor to run a tight ship. When you translate accident statistics into operational costs, I assure you that you can get managers on the off-duy accident-prevention bandwagon in a hurry.

How does one go about this job of communicating with management in business? How do you reach them to make them aware of the impact of off-duty accidents on their performance? The trick, of

course, is to communicate with them in the language they understand best. (Anecdote to illustrate communication.)

In talking over the problem with some of my staff, we decided to try this approach to sell off-duty accident prevention to our management. We enlisted the aid of our field managers to provide us with information—statistics if you will—on all off-duty accidents. The data were forwarded on a simple report form and analyzed to determine the complete cost of the accidents. As a result of this study, we were able to present to our district managers the "hidden costs" of their off-duty accidents.

"Hidden costs" are those beyond the readily apparent payroll dollars that we too often consider as the only loss associated with an accident. These are the penalties that you have to dig a little to locate but they are real and you will find that they are very significant multipliers of your payroll dollar losses. These costs can be measured in many ways, for example:

1. In dollars (both to the company and the employee)
2. Failure to provide service to your customers (and the repercussions)
3. Loss of efficiency in job performance
4. Tying up investments (tools and equipment not producing)
5. Diluting management efforts
6. Additional training requirements

In effect, what we are trying to do is provide management with a true measurement of the effects of off-duty accidents on the job.

While we are touching on the subject of measurement, I would like to give you an example of the seriousness with which we consider the measurement of job performance in the telephone company. Recently, I overheard a crusty old supervisor counseling a new foreman as follows: "The most important thing to remember, kid, is this: If it ain't a measured account, don't worry about it." There is a message there for all of us. It's high time we found a method to measure the true cost of off-duty accidents and to impress management with them so that they will show more concern for the losses incurred.

I would like to review with you the "hidden costs" behind some actual off-duty cases in my division to illustrate how we measure them. Incidentally, these are all accidents which resulted in actual lost time. We shouldn't lose sight of the fact that there are also many cases of off-duty injuries that partially disable employees but not to the extent that they don't report for work. These are the men who show up with a swollen ankle, a strained wrist, or a lame back, which handicaps their productivity to some extent. They may not reflect lost time, but the lowered efficiency is very much in evidence.

Frankly, I don't know at this time how to accumulate costs on this type of case. (Presentation of three case studies described below.)

The ratio of off-the-job accidents to on-the-job accidents indicates where vigorous accident prevention efforts must be made. However, a word of caution regarding the use of this ratio—don't use it as a club, because someone may decide to show quick improvement by increasing the number of his *on*-duty accidents. You can always find someone ready to play a numbers game with you.

To sum up, the total cost of off-duty accidents is something to be concerned with in business, both large and small. Look beyond the day's wage paid for which you get no production and you will be surprised at what these enforced absences are costing.

I hope that you will accept the challenge of reducing these costs by planning off-duty accident-prevention programs with imagination and appeal. More important, you must convince your management people that your programs will have a plus effect on production and costs. I am sure you will find that they will get behind your off-duty safety programs and push just as hard as you do for improvement.

If we work together toward this end, we can look forward to a happier day when the prevention of off-duty accidents can be checked off as another job being well done.

* * *

Case A—This was an off-duty fatality which might well have been prevented if we had reached the man with our seat belt program. Like many companies, we have made a real effort to sell our people on the value of seat belts in their private vehicles. Apparently, we didn't try hard enough. Had he been wearing a seat belt, we are quite sure there would be no case to discuss here today. Let me add that nowhere in this presentation can I measure the grief and personal loss to this man's family.

If the question has been raised as to what this accident cost the company, probably the answer from most of my people would have been the "death benefit"—$7,412. What else did it cost? Would it surprise you if I said almost three times again as much in "hidden cost?" Let's take a look at it.

In our business we try to advance people through the crafts, that is, when there is an opening in the higher paid crafts, we generally reach down into the lower paying ones and select a man with the requisite capabilities to fill the job opening. In this case, we moved four people: installer to splicer, a lineman to installer, a construction clerk to lineman, and a man off the street to fill the construction clerk's job. Basic training in the new crafts assigned to these men totaled $2,400. Effi-

ciency or productivity loss, as a result of moving four men into unfamiliar job assignments, we reckoned at $10,100 over a period of a year! This is based on a supposed 75-percent productivity in the first year. Special supervisory time required by these employees, time which might well have been directed elsewhere to the management job, we calculated at $4,000 over a period of a year. Advanced training was required for two of these men and this came to $3,200. Clerical costs, tool transfers, and payroll changes amounted to approximately $100 per man, and interviews, testing, and medical examinations for the new construction clerk cost us about $200. These "hidden costs" add up to $20,300, approximately three times the death benefit itself! In addition, because of the inexperience factor in our line force, the transfer of the lineman necessitated a temporary revamping of our two-man operation. We had to, for a period of time, revert to a less efficient three-man line gang operation.

Case B—While helping his wife hang curtains, this man fell from a ladder into a window and severed tendons in his hand. Sixteen days lost time which in apparent payroll costs amounted to about $400. However, in order to complete the workload in his group, we were required to work other men 64 hours at premium rates amounting to $320. He came back to work on a light duty assignment for 30 days, at about a 25-percent productivity rate. This amounted to approximately a $600 loss. Additional lost supervisory time—home visits, etc.—amounted to $80. Medical department visits after returning to the job and incidental departmental costs to the company, $180. These "hidden costs" totaled $1,180. Again you see the "multiplier" factor when comparing "hidden costs" to the payroll losses. This particular accident also cost the individual more than the pain of his injury. For some time he had been asking for a transfer to another division and the details to accomplish this had been arranged. However, he could not report to his new location because of his injury and by the time he returned, the job at the other location had been filled.

Case C—This man was injured in an off-duty accident which caused him to be absent for 26 weeks. The total cost for benefit payments amounted to $1,115. Here again his long absence required a replacement from another craft in order to meet workloads. More basic training costs, more efficiency loss in job performance, and another man added to the force conservatively totaled $2,745. This does not include any additional future costs that accrue whenever you add a man to your payroll. There were also dollar losses to this individual in addition to the reduced pay he received while off the job. We know that he had to part with some savings to meet expenses.

I hope that these few cases will illustrate how the "multipliers" in "hidden costs" can pyramid the dollar losses resulting from off-duty accidents.

Payroll dollars and benefit payments are only the beginning. Off-the-job accidents cost you more, too, because the severity of the injury is generally greater than those of an on-duty accident, thereby causing more lost time.

WORKSHOP: BUILDING SAFETY INTO RESEARCH AND DEVELOPMENT

Moderator: Dr. Glen T. Seaborg, Chairman, U.S. Atomic Energy Commission

Introduction

J. Sharp Queener, *Manager, Safety and Fire Protection Division, E. I. du Pont de Nemours & Company*

I welcome you this morning to the workshop "Building Safety Into Research and Development."

This year, for the first time, the President's Conference on Occupational Safety is devoting a workshop session specifically to accident problems and prevention techniques in R&D activities.

There are a number of reasons—all of them good—for holding a special workshop in this field; for focusing attention on the hazards encountered by workers in this "Industry of Discovery" and on measures for safeguarding all those whose daily duties involve scrutinizing the inscrutable, pondering the imponderable, and probing the unknown, in unceasing effort to extend the frontiers of man's knowledge of himself and the universe in which he lives.

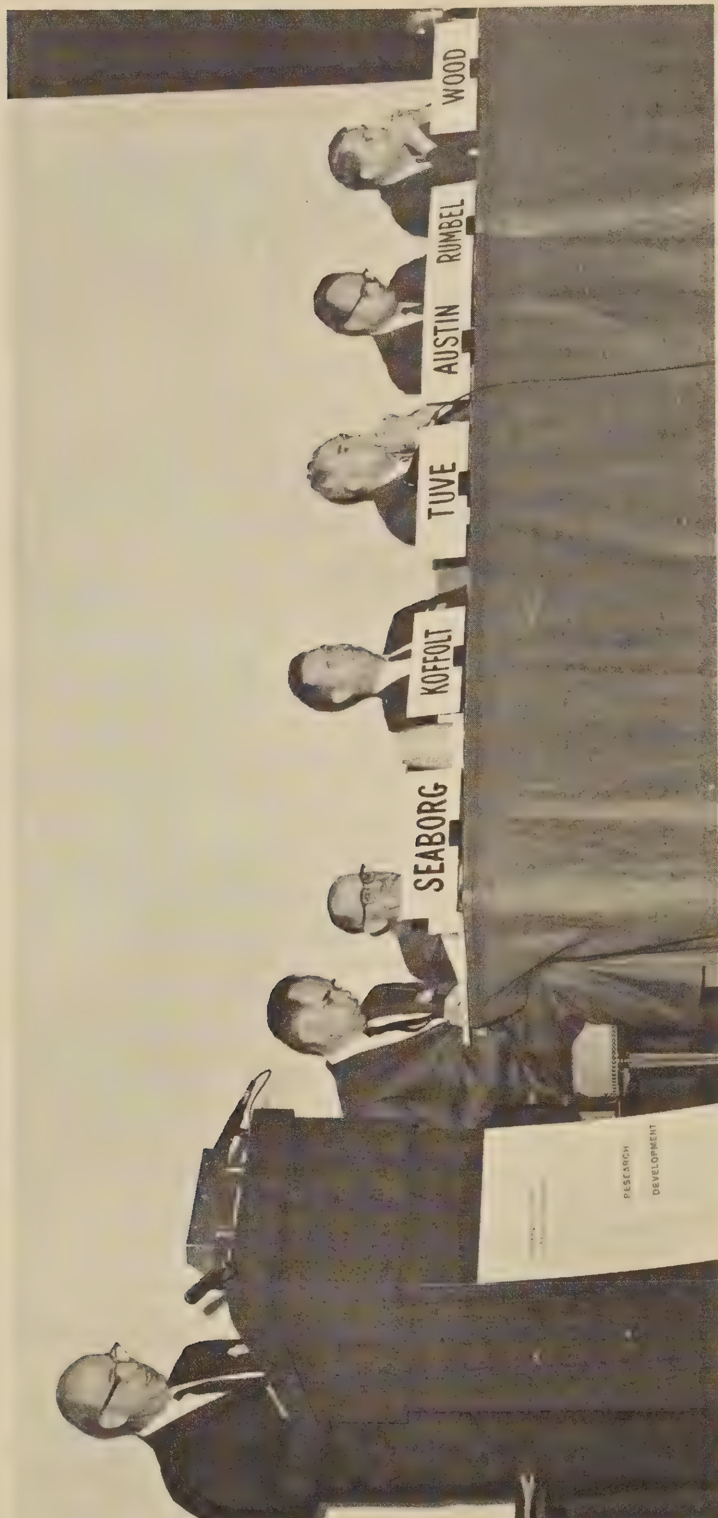
To mention a few reasons for this workshop:

1. Today there are an estimated 2¾ million specialists working in R&D, about 3.6 percent of the civilian work force. By 1970, it is expected the figure will reach 4.7 percent. Industry, colleges and universities, and the Government—all are involved.

2. The United States is currently spending close to $20 billion a year on R&D work.

3. Among occupations where job demand is heaviest and will continue to be so, are scientists, engineers, and technicians, especially in defense, aerospace, and health-related research, as well as in technical assistance programs.

4. R&D personnel for the most part are highly trained; their own and the Nation's investment in know-how and skill—although not susceptible to precise measurement—is enormous. As President Johnson has said, "The Nation which is investing millions of dollars in



J. Sharp Queener, E. I. du Pont de Nemours & Co. (at lectern) welcomes delegates to Conference workshop: "Building Safety Into Research and Development." The 1964 Conference was the first to have sponsored a session dealing specifically with safety of workers engaged in R&D.

training and retraining manpower, in enriching our skills to meet the demands of technological progress, cannot afford to waste that investment through preventable work injuries." Nowhere is this truer than in R&D.

5. Whether engaged in basic "pure" research or in product or process development, workers in R&D are pioneers—much of what they are doing has never been done before, many times they work with materials whose properties are but imperfectly known, often using novel, unproved methods and instrumentation. Much R&D work involves forces of such potential that—like the first nuclear chain reaction—if it cannot be done *safely*, it cannot be done *at all.*

I take great pleasure in introducing to you our moderator of the workshop—a man who heads up a Government agency which has proven "it can be done safely."

There is a great deal I could tell you about him but I shall give you only some broad brush strokes to picture to you his eminent qualifications.

He received his first degree in chemistry from UCLA in 1934 and his doctor of philosophy in chemistry from the University of California, Berkeley, in 1937.

He became associated with the faculty there and continued working at the university with successive promotions to assistant professor of chemistry until 1942 when he was give a leave of absence to head the plutonium work of the Manhattan project at the University of Chicago Metallurgical Laboratory. He had in 1941 become codiscoverer of plutonium 239.

He continued at Metallurgical Laboratory until 1946 as chief of the section working on transuranium elements. One of his principal responsibilities was directing the development of the chemical process which was used for the separation of plutonium from fuel elements irradiated in the production reactors at the Hanford installation at Richland, Wash.

He returned to the University of California, Berkeley, in 1946 as full professor of chemistry and also took responsibility for the direction of nuclear chemical research at the Lawrence Radiation Laboratory operated for the AEC by the university.

He was associate director of this laboratory and the chancellor of the University of California, Berkeley, when he resigned to come with the AEC in 1958.

He has engaged in much scientific work, discovered or helped discover many new elements or identified dozens of isotopes of elements. He has authored approximately 200 scientific papers and several books.

He has won many honors, including honorary degrees, medals and awards, including the Nobel Prize in Chemistry in 1951.

In 1961, he became chairman of the AEC and is currently in that position. In all of his scientific pursuits, particularly in the nuclear field, "safety has been a must," and it is more than appropriate that I give you as moderator of our workshop, Dr. Glenn T. Seaborg.

Statement by DR. SEABORG

I was pleased and at the same time somewhat concerned when Secretary Wirtz asked if I would serve as moderator for this workshop on Research and Development Safety. It is not only a first in this biennial series of President's Conferences on Occupational Safety, it is also a first for me in being called upon to moderate a session on the topic of safety.

As Mr. Queener emphasized in his opening remarks, all of us are deeply concerned as we face a future of rapid technological change—a future that will place its heaviest job demands on scientific and technical personnel. We will be trying to do all that we can to prevent the occurrence of accidents with their inevitable toll of lives, disablement, damage to property, and irrecoverable costs in terms of our national productivity. In this period of technological growth, research and development occupies a central role both in its capability for increasing productivity directly and in the assistance it can give to increased safety on all jobs where science and technology are contributing factors.

Before introducing the speakers for this workshop, I want to recall briefly for you an incident that occurred in Chicago on December 2, 1942. A small group of scientists were gathered on what had been the squash-racket court beneath the west stands of Stagg Field. They had been there since 8 o'clock that morning preparing for an experiment that would tell them whether or not a self-sustaining fission reaction could be obtained in the crude nuclear reactor they had built, thus making possible the reactor production of the fissionable element, plutonium, for use in nuclear weapons.

I quote from one of the better known accounts of this experience. "On the floor of the squash court just beneath the balcony stood George Weil whose duty it was to handle the final control rod. In the pile were three sets of control rods. One set was automatic and could be controlled from the balcony. Another was an emergency safety rod. Attached to one end of this rod was a rope running through the pile and weighted heavily on the open end. The rod was withdrawn from the pile and tied by another rope to the balcony.

Hilberry was ready to cut this rope with an axe should something unexpected happen or in case the automatic safety rods failed. The third rod operated by Weil was the one which actually held the reaction in check until withdrawn the proper distance.

"Since this demonstration was new and different from anything ever done before, complete reliance was not placed on mechanically operated control rods. Therefore, a 'liquid control squad' composed of Harold Lichtenberger, W. Nyer, and A. C. Graves stood on a platform above the pile. They were prepared to flood the pile with cadmium salt solution in case of mechanical failure of the control rods. Each group rehearsed its part of the experiment. At 9:45 Fermi ordered the electrically operated control rods withdrawn."

What I have just described, of course, is the famous experiment conducted by Enrico Fermi and the safety precautions taken on this historical occasion. About 4 p.m. that day, the successful culmination of this experiment demonstrated the feasibility of a self-sustaining nuclear reaction and started us on the road to large-scale production of plutonium.

No one was hurt; the experiment was a great success. The chief credit for this, as you can tell from the facts I have recited, may be credited to this group's, and Enrico Fermi's, very careful planning to anticipate all the possible hazards that might arise, and to provide fully for their control in the event they should arise. I might say that Fermi's precautions constituted the first reactor hazards analysis and that subsequent reactor hazards analysis has proved so essential and has been so well developed in our program that it was only natural to extend this concept in helping to solve safety problems in our research laboratories. It is the Commission's general practice to require as a part of laboratory plans submitted by prospective builders that they include both hazards analysis and fire protection studies of the proposed laboratory. Thus it is possible to anticipate at least some of the hazards that might be encountered in the operation of the laboratory.

This little bit of nuclear safety history is intended only to give you a taste of what our program has in store.

Today, we are going to look at the problems of safety in research and development from a number of different perspectives. From the academic world, the Government laboratory, and industrial research and development organizations, we have drawn on the talents of men widely experienced in this field to present their views.

Mr. Queener's opening remarks lead me to pose the question, "How can we fully protect the safety and health of each individual and at the same time conserve an expensively acquired, possibly irreplaceable skill?"

In research and development, as is true everywhere, there is bound to be risk involved in our day-to-day activities. To shun risk is to forego progress. What we attempt to do is to change an uncalculated, ill-defined risk to a calculated risk. Thus we may weigh the benefits to be gained against the risks involved, and also, if we decide to proceed, we may proceed with the advantage of having partially reduced the area of the unknown.

If research and development is to be done safely, we must consider the need for close, effective, and continuing liaison and coordination between scientists who are planning and will engage in the work—not forgetting to bring into the picture also service managers and safety personnel. Training is important up and down the line, from the top scientist to the newest technical assistant who like the rabbit in Pogo may only be there to "carry the hose."

We will consider in this workshop not only the total staff involved but the total sequence of operations as well—from laboratory bench and scale—up to pilot plant operations.

Our workshop this morning is designed to cover the varied aspects of safety in the diverse panorama of research and development. I shall introduce each speaker who will present his thoughts. When all the presentations have been made, we shall have an open floor discussion.

The Academician Looks at Research and Development Safety

JOSEPH H. KOFFOLT, *Chairman and Professor of Chemical Engineering, The Ohio State University, Columbus*

It is well known that many of the graduates of our universities who accept positions in research and development are not basically safety minded. Industry spends many man-hours and goes to considerable expense to teach them safety practices which they should have learned and practiced as undergraduate and graduate students.

This discussion of safety in laboratory research and development work in the university is based upon the following premises:

1. The university student is not immortal. Many engineers and scientists guess (not think) that they are members of an "Angelic Fraternity."

2. University charters do not grant laboratories "inherent" immunity from the practice of "horsesense" and recognized safety practices.

3. Personnel representatives are not interested in interviewing dead, or nearly dead, chemical engineers.

4. Engineering and scientific education fails to measure up to its responsibilities if it does not recognize safety in connection with its work in the laboratory, whether it be course work, fundamental research, or development.

5. A university laboratory should be as safe as can be conceived with present technology.

6. Every major chemical company in the United States knows that safety is just good business. These companies do not expect production at the cost of injury to employees; a university similarly should not expect pioneer contributions to engineering and science at the cost of a so-called "calculated risk." We in the chemical engineering department of the Ohio State University believe that indoctrination in safe practices should begin at the undergraduate level. Since this is not consistently done in other laboratory courses in other departments, the first significant opportunity we have to do this is in our unit operations laboratory course which is given between the fourth and fifth year. By putting good safety practices into operation in our unit operations laboratory, we have the opportunity to correct unsafe habits the students have learned elsewhere. We can teach them at this time that practicing safety in the undergraduate laboratory is the best preparation for successful work in research and development whether it be in advanced undergraduate and graduate research at the university or in their subsequent career in industry.

The following gives some of the details of our safety program and the departmental safety committees:

Departmental Safety Committee.—There are three safety committees in the department: (1) a general safety committee, consisting of senior staff members which formulates and establishes departmental policy on all safety and potential hazards. This committee reviews the reports of the departmental safety committee who make biweekly inspections of all laboratories and makes recommendations of action to be taken; (2) divisional safety committee, consisting of senior staff members who are responsible for housekeeping and safety in the various laboratories; and (3) departmental safety committee, consisting of a senior staff member as chairman and graduate students who make the biweekly inspection of all laboratories. Exhibit I, form I, of this paper gives the form of the report used in the inspection of the laboratories. The rosters of these committees are given in Exhibits III, IV, memoranda 641 and 642. Exhibit II, form 2 gives the form for accident, fire, explosion, and damage to equipment report.

Safety Manual of the Department.—This manual is issued to students as "The Laws of the Medes and Persians," and a knowledge of it is considered essential to safe and efficient operation of the chemical

engineering laboratories. In the preparation of the manual, we are indebted to the many chemical companies who have cooperated so unselfishly in making available, with "no strings attached," the safety practices in their companies. We hope that we will be able to reciprocate by sending to all of these fine companies beginning chemical engineers "worthy of their major responsibility," namely, a sense of safety consciousness to one's fellow workers, to one's self, to equipment, and to one's institution or company.

Safety Program of Department of Chemical Engineering

Safety consciousness in chemical engineering laboratory work at Ohio State goes back to 1906 when Dr. James R. Withrow, the first chairman of the department, took charge. In 1946, when the College of Engineering adopted the 5-year program, a lecture-recitation course in safety was put into the curriculum. The comments of the students were good, bad, and indifferent. It was quite common to hear a group of students say "We will be safety conscious for the next 50 minutes."

It was the unanimous opinion of the staff that, although the objectives of such a course were ideal and altruistic, in the final analysis it preached but did not practice safety. It produced various grades of safety-minded chemical engineering students from "A" to "D" grades. This course was dropped from the curriculum in 1952. In its place, safety was integrated in all courses possible, and especially in the laboratory courses. Safety is practiced at all times in the unit operations, instrumentation, process development, project problems, and the nuclear laboratory courses.

1. *Organization of the Safety Program in the Chemical Engineering Laboratories.*—The students are given their first intensive work in safety the first day of the chemical engineering operations laboratory which is given during the summer quarter between the fourth and fifth years. By emphasizing safety and *maintaining* good safety practices from the very beginning of the laboratory work, the student as well as staff members are instilled with the sense of "safety consciousness" that carries over into their laboratory courses at the university and eventually into industry.

The safety program may be best described by giving a few details.

First Day of Unit Operations Laboratory (Monday, June 24, 1963)

8 a.m.—Class organization and details of the Unit Operations course.

9 to 11 a.m.—Safety in the Chemical Engineering Laboratories. Each student is given a copy of the safety manual, a pair of safety glasses, and a hard hat. The latter is returned at the end of the course. The

safety glasses are charged to the student. Those students who already wear glasses may obtain prescription safety glasses from our Department of Optometry at a reduced price.

The safety manual covers many items concerning safe practices in the laboratory such as handling chemicals, toxicity, gas masks, ladders, and organization of the safety committee. The following are some of the details contained in the safety manual.

1. Safety glasses shall be worn in all laboratories and shops that are in operation.

2. Hard hats shall be worn in the Unit Operations Laboratory when this laboratory is in operation.

3. Under no circumstances shall Bermuda shorts be worn while working in a laboratory.

4. If an injury is received, no matter how slight, it is reported at once to the instructor, and if he is not available, to the Departmental Office. There is always someone available at the university health center or the hospital, if necessary.

5. There is no work after hours, unless a permit is obtained from the office of special services. This requires a card requesting such a permit be granted by the chairman of the department.

Working after 5 p.m. on Saturdays in the shops is prohibited, unless someone else is present within calling distance.

6. Good housekeeping shall be maintained at all times. Quoting from item *Unit Operations Laboratory*[1] *Course Organization 15–k, Duties of Squad Foreman*, "good housekeeping shall be maintained at all times. This is the most important duty of the squad foreman. He will detail members of his squad to assure (by use of mop, broom, hose, and other 'diver' means) that untidy working conditions such as precipitates from filter presses, oil from steam pumps on evaporator, dust from the crushers and grinders, and water and solvents on the floor from laboratory problems on distillation, heat transfer, evaporation, fluid flow, furnacing, liquid-liquid extraction, humidification and electrolysis during the course of experimental work, is cleaned up at all times. Untidy working conditions during the course of an experimental test run *will not be tolerated.* Spillage must be cleaned up at once. Infraction of this rule will result in stopping all work until the 'mess' is cleaned up. In many cases it will result in starting the particular 'test run' over again. It is the responsibility of the rotating squad foreman to assign members of his squad to maintain good

[1]Unit Operations are the means of meeting the chemical engineering requirements, which are the demands made upon the engineering by market, economics, and by the chemistry. They are steps involving engineering principles, e.g., design or the determination of size of equipment needed to carry out the various kinds of physical changes. Some typical unit operations are distillation, filtration, evaporation, drying, crushing and grinding, etc.

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housekeeping conditions at all times. As most of the experimental work requires from 6 to 16 hours of time, he should plan his schedule so that every member of his squad is responsible for good housekeeping and knows how to handle the 'mop' and 'broom.' The rotating foreman shall not handle the mop or broom. The rotating foreman is the 'boss man.' He does not work, he supervises."

11 a.m. to 3 p.m.—The class is organized in squads of four each. This organization is kept for the duration of the course. Each squad, under the supervision of an instructor, spends 1 hour each on the items listed below.

1. *Inspection of laboratories.*—Locations of all emergency utility controls, various types of fire extinguishers, gas masks, fire blankets, stretcher, master valves for gas, air, water, and steam are noted.
2. *Gas mask and respirators.*—A short lecture is given on these items, their construction, and where they are to be used. Each student is required to try the various types, and test them for leaks, in order to familiarize themselves with the method and adjustment and use of the masks and respirators.
3. *Explosion meter.*—A brief lecture is given on explosive limits, what to do in case of spillage of inflammable solvents, and the principles of construction and operation of the various types of explosion meters and other detecting devices. Each student is then required to operate these instruments with synthetic explosive mixtures (in a quantity which will not cause damage).

3 to 4:30 p.m.—*Fire prevention and demonstration.*—The fire marshal of the university explains the construction and use of various types of fire-fighting equipment, the various classes of fires and the types of extinguishers to be used. This is covered in detail in the safety manual issued to the students. The class then adjourns to a vacant lot on the university property where the various classes of fire are demonstrated. The use of the right and wrong types of extinguishers are demonstrated. Each student then operates the various types of extinguishers so that he will be familiar with their operation.

Emergency Calls Information Card.—Posted on the doorway of each laboratory is the following 4 x 6 inch card:

IN THE EVENT OF AN EMERGENCY CALL

FIRE DEPARTMENT*.................................... 6717

POLICE DEPARTMENT*.................................. 6616

SERVICE DEPARTMENT.................................. 6158

*If required only.

____________________, Student Operating Equipment

____________________, Project Adviser

Edwin R. Haering, Chairman, Departmental Safety Committee...885–7991

Joseph H. Koffolt, Department Chairman.................. AM 2–5785

EXHIBIT I

THE OHIO STATE UNIVERSITY, DEPARTMENT OF CHEMICAL ENGINEERING

SAFETY INSPECTION REPORT

FORM 1

AREA, ROOM, OR LABORATORY LOCKER INSPECTED ....

INSPECTED BY .... DATE ....

In column marked Rating, indicate Grade as follows: Poor, Fair, Good, and Very Good. Give comments and recommendations in spaces indicated. Use supplementary sheet if necessary and refer by number.

	Rating
1. Date of last inspection .... Has the condition improved and have all recommendations made been carried out. If not, why not?	
2. GENERAL APPEARANCE AND HOUSEKEEPING	
A. Floors	....
B. Laboratory desks	....
C. Equipment	....
D. Apparatus	....
E. General comments	....

3. SAFETY EQUIPMENT. Adequate and in good working order.	
A. Gas masks	
B. Safety showers	
C. Fire equipment	
D. Fire blankets	
E. Respirators	
F. Adequate escape doors	
G. First aid cabinets	
H. General comments and recommendations	

In the above, include empty bottles that should be dumped, cleaned and then junked; spills not cleaned up; slippery floors, dirty equipment.

Date ------------------- Room or Area ------

4. Unsafe acts and unsafe conditions	Description	Rating
a. Inadequately guarded		
b. Unguarded		
c. Defective conditions		
d. Unsafe design or const.		
e. Hazardous arrangement		
f. Unsafe illumination		
g. Unsafe ventilation		
h. Unsafe dress		
i. Operating without authority		
j. Operating unsafe speed		
k. Making safety devices unoperative		
l. Using unsafe equipment		

m. Unsafe loading		
n. Failure to use protective devices		
o. Working on moving or dangerous equipment		
p. Horseplay, teasing		
q. Using defective or the wrong kind of tools.		
r. Taking unsafe position		
s. Proper containers for rubbish, oil, chemicals, etc.		

In the above, pay particular attention to the following: Cylinders not chained, defective ladders, loose floor covering, uninsulated steam lines, exposed and unsafe electrical wiring, broken or missing sewer guards, equipment that is in need of repair, baling wire methods, and bottles or drums, that are labeled or should not be scored in a given area.

It is recommended that conditions are such to warrant shutting down the project until all safety precautions including housekeeping are rectified.

No ---- Yes -----.

Revised 6/12/64.

EXHIBIT II

The Ohio State University Department of Chemical Engineering

HAZARD, HAZARDOUS PRACTICE

Form 2, *Accident, Injury, Fire Explosion, and Damage to Equipment and Apparatus Report*

This report shall be submitted to the chairman of the department within 24 hours of the accident and in quadruplicate. Separate reports shall be submitted by the following: (1) The person or persons concerned in the accident, (2) the member of the divisional safety committee in charge of the area in which the accident has occurred, (3) the advisor in charge of the research project, or the instructor in charge of the laboratory problem, and (4) the chairman of the committee appointed to investigate serious accidents (see page 17, item 6). One copy of each of these reports will be forwarded to: (1) the President's office, (2) the Dean of the College of Engineering, (3) Mr. Elleman, Director of the Physical Plant of the University, and (4) Departmental Files. Any student or staff member knowing of a hazard or hazardous practice is expected to submit this report.

Reported by ------------------- Date -------------------

1. Date of accident ------------------ Time ---------- Room No. ----------
2. Advisor or instructor in charge of the research or laboratory problem --------

   ----
3. Title of the project --
4. Equipment and materials used --
5. Name of person injured ------------------------------------ Class ----------
6. Nature of injury --

   (Use additional page if necessary)
7. Describe any first aid treatment given before bringing the injured to the University Health Center or hospital --

   ----
8. Name of person bringing injured person to the above----------------------.
   Name of doctor or nurse treating the injured person --------------------.
   Time when the injured person was brought to the hospital or the University Health Center --
9. Brief description of treatment given ------------------------------------

   ----
10. Description of accident, fire, explosion, hazard, or hazardous practice (Use additional sheet if necessary) ---

    ----
11. If fire, give cause, duration and how extinguished ----------------------

    ----

    Extinguisher O.S.U. No. ------- Refilled ---------- Date refilled ----------
12. If no injury sustained, how might one occur? ----------------------------

EXHIBIT III

THE OHIO STATE UNIVERSITY, DEPARTMENT OF CHEMICAL ENGINEERING

Memorandum: 641 *July 31, 1963.*

TO: All Staff Members.

FROM: Chairman, Department of Chemical Engineering.

SUBJECT: Appointment of the 1963–64 Fire Drill Committee for the Chemical Engineering Building.

1. In accordance with the University rules, the following staff members are appointed to the Fire Drill Committee for the 1963–64 school year. The duties of this committee will be those outlined in the University Fire Regulations and any other that the Chairman may assign in connection with Fire Safety:

Chemical Engineering Building
Fire Drill Committee
1963–64

	Extension
Building Fire Warden (Chairman)—E. R. Haering	2727
Deputy Warden—G. A. Wilcox	2907
Floor Wardens:	
Basement—K. H. Latham	2728
1st Floor—K. L. Moazed	2491
2nd Floor—R. S. Brodkey	2609
3rd Floor—H. C. Slider	2698
4th Floor—A. Syverson	2907
Ex-Officio Members:	
J. H. Koffolt	6591
M. G. Fontana	2491

Joseph H. Koffolt,
(Signed) JOSEPH H. KOFFOLT,
Chairman, Chemical Engineering.

EXHIBIT IV

THE OHIO STATE UNIVERSITY DEPARTMENT OF CHEMICAL ENGINEERING

Memorandum: 642 *July 31, 1963.*

TO: All Staff Members and Graduate Students

FROM: Chairman, Department of Chemical Engineering

SUBJECT: Appointment of the 1963–64 Safety Committees

1. In accordance with the Departmental Safety Manual, the following committees are appointed for the 1963–1964 school year. The duties of the committee will be those contained in the Safety Manual and any other the Chairman may assign.

2. *General Safety Committee*—E. R. Haering, Chairman

Professor J. H. Koffolt
Professor W. B. Kay
Professor A. Syverson
Professor C. J. Geankoplis
Professor C. E. Dryden
Professor T. E. Corrigan
Professor T. S. Sweeney
Professor R. S. Brodkey
Professor P. O. Krumin
Professor E. E. Smith
Professor W. D. Sheets
Professor H. C. Slider
Mr. G. A. Wilcox
Mr. L. Wing

3. *Divisional Safety Committee*—E. R. Haering, Chairman

a. G. A. Wilcox	Chemical Engineering Unit Operations Lab.
b. K. Latham	Shop and Storage Areas.
c. W. B. Kay	Rooms 412, 414, 416, 431, 432, 433, 434, 435, and 436.
d. A. Syverson	Rooms 421, 423, 100, 110, 214, 225, 314.
e. C. J. Geankoplis	Rooms 405, 330, 331, 332, 336, 333, 407.
f. R. S. Brodkey	Rooms 206, 210, 235, 303, 305, 306, 308, 310, 312, 329.
g. T. E. Corrigan	Rooms 205, 207, 208, 221, 229, 307, 321, 325, 118.
h. H. C. Slider	Rooms 130, 425, 335.
i. H. Breining	Instrument Rooms.
j. L. Wing	Rooms 29, 31, 33, Co 60 Pool, 103.

The remaining rooms on the first and second floors are assigned to Metallurgical Engineering and safety of these labs are under the jurisdiction of the Chairman of Metallurgical Engineering.

4. *Departmental Safety Committee*—General Chairman, E. R. Haering.

Month	Chairman	Inspectors
October	W. B. Kay	Lackenson, Metelko, Cunningham, Cutlip, Constantinides, Buddemeyer.
November	C. Geankoplis	Hazlebeck, Jarrett, Sapp, Jones, McAdams, Vajnar.
December	T. Corrigan	Hammond, Ferris, Kirsch, Ballard, Croskey, Petz.
January	R. Brodkey	Kovach, Denny, Abraham, Genco Scattoloni, Tamayo.
February	A. Syverson	Hayhow, Mills, Dunlop, Barber, Axline, Moomaw.
March	G. Wilcox	Gilsdorf, Groening, Chun, Mehta, Wilson, Whitmer.
April	H. Slider	Corino, Sonawala, Williamson, Kim, Pachko, Skillicorn.
May	T. Sweeney	Bidstrup, Gates, Dague, Corder, Stazenski, Betschel.
Summer quarter	E. Haering	To be assigned later.

5. *Fallout Shelter*—Manager, E. R. Haering.

Assistants:

H. C. Slider.
G. A. Wilcox.
L. Wing.

Safeguarding Research By Presearch

Dr. Richard L. Tuve, *Head, Engineering Research Branch, U.S. Naval Research Laboratory, Washington, D.C.*

My assignment this morning deals with a rather indeterminate and somewhat indefinable area in the general subject of "Safety in Research and Development Programs." In order to channel your thoughts to some extent I am going to seize upon that time in the conduct of a research and development program to talk about—when some small scale experiments have been decided upon. Perhaps some orienting tests are planned, so that the research worker can determine which direction might be the most fruitful of *several* courses of investigation which look attractive—after his literature search and his cellulose and graphite (paper and pencil) deliberations have come to some suitable stopping point and experimental work is clearly needed.

After all, research in its early stages hardly knows where it's going—if it did, there would be little point in doing the research.

I've heard a lot of criticisms over the years about the attitude of scientists in general concerning safety and safety precautions. We've been accused of being superior and "untouchable" when it comes to safety regulations and preparations for adequate precautions in experimental work. I would like to put a stop to these rumors. They just aren't true—except in certain cases of poor attitudes and slovenly workmanship in laboratory. With careful teaching in the halls of universities, such as you heard described by Dr. Koffolt, a well-prepared scientist can't help but be fully aware of the need for safety precautions before he gets very far in research.

The problem that *does* exist, however, between safety personnel and scientists is purely one of poor communications. Sometimes these two types don't talk the same language. The scientist tries to point out certain areas of safety needs that he knows about and the safety man, not to be outdone, places high importance on *other* areas and pretty soon there's a clash of pure personalities. This must be avoided with a little of the "Dale Carnegie" type of approach.

There *is* an area where the scientist is certainly culpable in safety matters, however. This concerns the simple, everyday, home-grown, type of safety. The safety regulations of frayed electric cords, oil-covered slippery floors and grounding leads for his electric handtools. This we have to watch out for. The "head in the clouds" *must* keep his feet on solid ground.

I'm certain that there are many different scientific disciplines represented here this morning, from the field of biology and electronics down (alphabetically, that is) to zymology. (Which, in case you didn't know it, is the study of fermentation processes—like beer.) I would like to specialize a little bit and emphasize the field of safety in chemis-

try or chemical research. This field is probably as fraught with dangers as manifold and grave as we can find, and furthermore my chosen work is chemical and engineering research and I feel most comfortable when I'm talking about chemical dangers. To be more specific, my work for the past quarter of a century has been in explosives and fire research and development—more dangerous than this, one can hardly get.

When I was assembling these remarks and trying to do some basic thinking about safety in research, I was struck by a purely philosophical point which I wonder whether has occurred to many of you. This is concerned with the fact that the promotion of safety and preparations for achieving it—in research or elsewhere—is a matter of *faith* to a considerable extent. Somewhere, I've heard the expression that safety is an attitude of mind. If we *think* safety we'll *achieve* safety.

I'm constrained to mention the similarity of these concepts to that of a *religion.* Safety, to be fully described, appears to me to be somewhat of a *religion*, combining requirements for constant attention to some basic tenets of good practice with faith in the beneficence of the eventual outcome. And like any of the world's great religions, safety exists for the selection and embrace of the individual. No power on earth can force a person into a belief in the principles of safety. Faith in the need for both safety and religion originate in the individual.

Perhaps if we carried this thinking a little further, we might be inclined to call this session a *retreat.* I'm sure this would be a good idea if we could carry back to our everyday work some inspiring ideas of how better to achieve safety in research programs.

The film city of moviedom, Hollywood, Calif., has produced one of the most effective cliches in the modern transmission or communication of ideas. How many of you have seen one of the tremendously clever personalities of the TV or movies put his finger up to his temple and tap it studiously when asked how he did something or planned something? "*Always thinking!*"

This is the essence of safety presearch: Always thinking—*ahead*, that is—when an experiment is planned, its variables are also planned. The physical and chemical characteristics of the reactants must be known either by careful pretesting or by literature search. Their properties with respect to the *expected* temperature and pressure variables of the experiment to be conducted must be carefully noted and taken into account in the design of the experiment and design of the equipment to be used.

Now these characteristics take care of only the properties of *matter* with respect to *materials* safety. We must still put into this equation the physiological effects of reactants and reaction products since all these experiments will be conducted by human beings. Toxicological considerations of compounds and safety of the *human* machine is the most important factor of the many-sided problems of safety.

And not only toxic effects from ingestion or contact must be looked into, but safety also requires being prepared for any damage to human beings, damage to the person by flying glass or metal from explosions, or damage from burns by fire. We can always buy new equipment, materials, or facilities for research, but we *can't* always replace the skills, experience, and abilities of the people who are doing the research.

One of the companies that we deal with in our research has a slogan that "People are everything" or something close to those words. We put a lot of faith in America in the value of the human being, and rightly so. And, lest some misgiving creeps into your minds, I'm talking about *all* human beings. In scientific experimentation, personal safety precautions apply to the plumber and the physicist with equal seriousness. We need them both.

At this point it is customary for any safety lecturer to start giving advice as to just what devices are available for safety protection. I'm sure this audience is too sophisticated to require this kind of detailed reminding of *things* for safety. I feel that my objective is to imprint on your minds the necessity for this one single preplanning action in order to have "safetythings" available when bench research is to be started. Preplan for safety by anticipating all the hazards that might possibly occur in your experimental research. This is pre-search before research! Accumulate knowledge from every available source, and get safety facilities that are needed.

I believe one of the most important methods for achieving this action is to know *where* to get this knowledge and one of the speakers today is going to talk about sources of information about safety preparedness. This will be extremely valuable to you.

Another customary action that usually occurs in safety talks of one kind of another is the citing of examples. These are usually especially selected by the speaker with the hope of generating renewed awareness of safety considerations in the minds of his listeners through horrendous recitals of body and equipment damage. I'm afraid I can't give you any personal examples of this type. In my years of directing dangerous research of the bench and original development type, I've been a real sissy—I've insisted on so many safety preparations that my people have shown their disgust many times—and many times our preparedness hasn't been needed. *But*, we've not had any personal injuries, either (any worse than a stepped-on nail) and we've only had *one* surprise fire of some frightening proportions. We've had some big planned ones though—up to a million gallons of fuel in one field test. In other tests, we've worked with highly toxic and self-igniting chemical rocket propellants within inches of the experimenter's face, but not without safety glass shields and high-velocity ventilation using very small-scale operations.

I have two important ideas which I would like to recommend for your thinking in the general area of safety: One idea is the post-

mortem session for *near misses* (near accidents, that is). And the other useful idea is the checklist.

Many times our research team has been *lucky* with a near accident. In these cases, despite careful preplanning before the research experiment, pressures or temperatures have risen to runaway points, but by some quirk of lucky fate, they have subsided to safe levels again. Similarly, we've had unexpected explosions or fires or generation of toxic materials, but by pure dumb luck, no one was exposed or no one happened to be in the area at that time. You'll have to agree with me that such happenings are pure gifts of God!

We never allow such lucky occasions to be unnoticed. An immediate survey and study of the situation takes place and the whole reaction is dissected to determine the causes of our "good luck." The experiment (or one like it) is never repeated until we can point to something that we *should have known* about before we first started. This sort of an investigation of *near* accidents is fully as important as the investigation of an accident that happened, causing damage thereby. I commend this for your consideration.

Another most important presearch aid to safety in research is the checklist. The *checklist* is an old institution and its standardization and continued use by aircraft pilots and operators is evidence of its lasting value. We can learn from them.

But, you say, how can we ever construct a uniform checklist for new and original research experiments and for pathfinding types of development tests. It isn't easy, but it *can* be done in a *general* fashion at least. Here is my checklist:

CHECKLIST FOR SAFETY IN RESEARCH
BY USING "PRE"-SEARCH

FOR SAFETY IN

I *Equipment and Materials Safety*	II *Personnel Safety*
Guard Against	
Explosion; Abnormal Temperatures; Fire; Release of Toxic Materials; Effect of Mass; Effect of Surroundings.	Ingestion or Absorption of Toxicants; Tissue Damage.
During Experimental Phases of	
Raw Materials Transfer; Equipment Fabrication; Reaction Kinetics; Product Characteristics Analysis.	Observation; Operation; Handling; Measurement; Analysis.
Provide this Information and Material	
Strength and Performance of Materials; Shielding Provisions; Cooling (or Warming) Agents; Fire Controlling Methods and Agents; Adequate Ventilation.	All Possible Knowledge of Toxic Limits; Body Protection by Remote Separation or Protective Clothing and Covering; Pure Air through Chemical or Physical Toxicant Removal.

I don't think this checklist is a completely universal one; for instance, I'm sure that in biomedical research, we would have to utilize principles of antisepsis to be safe from infectious disease transmission, and in oceanographical research we would place life preservers in the necessary category of equipment. However, the general idea of a checklist is worth your attention.

You will note that I've said nothing about radiological safety. The reason for this is that this branch of safety has grown into a completely separate area of attention dignified by the name "health physics." I don't consider myself very smart in this area and so I'm leaving that for someone else to discuss. There are many manuals and guides in this subject for the researcher and I would refer him to such specialized treatises.

To conclude, I would recommend that safety in research should include preplanning; always thinking; and adoption of safety to the point of its being almost a *religion*. *Your* life and *your* laboratory are worth the trouble of *presearch* before *research*.

Researching Safely

Dr. James B. Austin, *Administrative Vice President, Research and Technology, U.S. Steel Corp.*

In order to provide some background and perspective to my remarks, I would like to point out that my experience has been limited to one industry, in fact to one company, though the activities of that company are broad and varied. In addition, the company is very safety-conscious and has had an intensive safety program for many years. Consequently, the research department can, in certain areas, draw on a large reservoir of experience and we have available the considerable resources of the company's safety department. Yet the situation in a research laboratory is rarely exactly like that in a mill, and at times it is quite different. It is these differences that I should like to talk about chiefly, although one can never afford to overlook the similarities.

The range of potential hazards in a research laboratory is usually so varied that no single safety program is adequate. We have found it necessary, therefore, to have a diversified program which, though based on certain general principles, is capable of being fitted to meet the special requirements of different groups. Essentially, our hazards can be classified into four rather broad categories:

1. Those which are faced by all or by most employees.
2. Those arising primarily in service groups such as the machine shop, the general chemistry laboratory, or the photographic section.

3. Those encountered chiefly by personnel, whether technical or nontechnical, who work on research projects in groups or teams.
4. Those which are peculiar to the scientists or technologists who may be working alone or with one or two assistants and who may actually be generating new or unexpected risks as they devise new equipment or procedures.

Obviously, this classification is oversimplified and there are overlaps, but it is useful for the purposes of discussion.

The first category covers such things as traffic regulations for the grounds of our research center, the use of material-handling equipment, the storage, handling and use of compressed gases, and general work practice including housekeeping. As these are much the same as the problems met in most of our plants, we can and do cover most of them with the general program developed by the company's safety director and his staff.

The risks in the service groups are primarily those commonly associated with repetitive jobs since the materials, machines, and cameras or other equipment used vary only in application from job to job. Here again, many of the hazards are well known, or can be anticipated, and so are included in the formalized programs designed to cover the problems met every day. For example, the danger in using perchloric acid in the analytical laboratory is well recognized and so is included in the regular safety program.

There are, however, some aspects of the work of these groups which deserve special mention. For example, the photographic section may be called upon for jobs which require that the photographer be acquainted not only with the safe operation of his equipment but also that he be aware of the risks associated with the facilities or process being photographed. This usually means that he must be instructed in the safety practices required for many different operations.

Again, our shops and maintenance division, in addition to providing safe working conditions for its own employees, also has the responsibility for the safe operation of equipment that is installed for others in the laboratory. Thus, they make sure that there are guards over rotating parts and that there are no electrical hazards.

The third category of teams working on a research project includes a number of instances in which the inherent hazards may not be so well known or cannot always be anticipated. For example, such teams may work with a laboratory rolling mill on which we roll samples of experimental materials, or study the rolling process itself. This borders, perhaps, on pilot plant equipment which is the province of another speaker, yet the problems are not always the same. The changes in techniques and in the method of operating such facilities require the

constant awareness of the supervisor to update the prescribed safety procedures. So the safety department must depend heavily on the technical ability of this group to supply special data that will make it possible to avoid or prevent every known hazard. The cooperation of such teams with the service groups also minimizes the possibility of injury to personnel who may be unfamiliar with equipment they are requested to service.

The fourth group category, that of the essentially independent scientist, presents some of the most difficult problems. For one thing, his work is rarely repetitive and in working in a frontier area with new materials or new procedures, he may be generating risks which cannot easily be anticipated. Moreover, he often is an individualist with a distaste for standardized methods and may depart from them because he believes he knows what he is doing better than others. In general, he has little interest in safety statistics, safety records, or even safety meetings because he cannot see that they have much meaning for him as an individual. Admittedly, he doesn't want to become a statistic himself, but he seems to believe that safety is entirely his own responsibility and that he can take care of himself. Well, he *is* responsible for his own safety, but he doesn't always know how to take care of himself. And what is worse, he doesn't always realize that he may be subjecting others to risks which he may generate.

So this is an area in which the safety program must be continually reviewed and constantly expanded. The experience of other laboratories in disclosing new hazards must be followed and every effort must be made to make the scientist more conscious of his part in preventing accidents. All this takes much patience, and a good deal of foresight, but it is certainly worthwhile.

One thing that helps is that the administrators of our research center are all technical personnel who recognize the interests of those they supervise. We have found their aid invaluable in bridging the gap between the safety required on routine repetitive jobs and individual and highly technical assignments.

The formal part of our safety program is guided by the supervisor of safety at our research center who is the point of contact with the company's safety staff at headquarters. Is is his responsibility to help prepare safety manuals, to set up safety meetings or contacts, to check on safety procedures, to investigate accidents and to prepare the reports on them.

Each employee is given first a copy of the company's manual on general safety and plant conduct which discusses such subjects as clothing and protection for eyes, hands, head, and feet, and the proper use of machinery and tools. There is also a small manual prepared by

our research center which emphasizes some of the more common hazards there. A much larger manual given to supervisors describes in considerable detail the safety regulations and procedures. In addition, some of the supervisors issue special instructions covering the hazards likely to be met by their men. Safety meetings are held frequently and there are periodic inspections of equipment and procedures. The number of safety contacts averages about four per employee, per month. The performance of each division at the center is reported monthly to headquarters. Accidents must be reported promptly and a more detailed report is submitted after investigation. This report carries recommendations to prevent recurrence of the accident.

Some specialized hazards are covered by special procedures. For example, all employees who may be exposed to X-rays or radioactive materials are required to wear badges containing photographic films which are monitored by an outside company. Likewise, radioactive wastes are disposed of by an outside nuclear garbage group who operate under contract with us.

Beyond these formalized procedures, we are interested in why accidents occur and in such subjects as accident proneness. The services of a psychiatrist from the company medical department are also available.

All these procedures have, over the past 10 years at our research center, reduced the accident frequency to less than 1.5. This is far from the objective, which is zero, but does indicate progress toward this goal. During this period we have had a few disabling injuries, but only one of these was incurred by a scientist. Another injury resulted, however, from the faulty judgment of a scientist. The remaining injuries all involved nontechnical personnel.

In fact, we have reduced the safety hazards during working hours to the point that they can be regarded as less serious than some of the risks our employees take when they are away from the laboratory. We are, therefore, now devoting part of our safety programs to consideration of the possibility of accidents in the home, while driving, and when swimming in summer and skiing in winter.

Any safety program to be effective must be a continuing effort to make everyone aware of the possible hazards he may meet; but in a research laboratory, something more is needed. Everyone concerned must be constantly on the alert for new or unanticipated risks which requires the cooperation of the laboratory workers, the administration, and the safety staff. To paraphrase Thomas Jefferson: "The price of freedom from accidents is eternal vigilance."

Research Safety From Laboratory Phases Through Pilot Plant

KEITH E. RUMBEL, *Senior Vice President, Atlantic Research Corporation, Alexandria, Va.*

Research safety, from laboratory phases through pilot plant, encompasses a complex mixture of many things. Each new research task seems to be different from the ones preceding it. Each scale-up activity introduces its own unique problems. There is no single technique or guide which will guarantee safety in research and development activities. Research safety depends upon the attitude of management and the functioning of an effective safety program, the competence of the research personnel, a quantitative knowledge and effective communication of the risks involved, and the facilities available for use.

My presentation today consists of two parts. First, I will review with you four important factors in any research safety effort. Second, I will outline as a case study how a solid propellant incorporating a toxic ingredient was advanced from the laboratory phase to pilot plant manufacture.

I. Four Important Factors in Research-Through-Pilot-Plant Safety Efforts

In any research safety effort, there are four very important factors to consider. First and foremost is a factor which I will term *management safety posture*. By this term I mean the attitude toward safety which management establishes and condones, and also the stability of such attitude.

Management safety posture begins with a working philosophy of what constitutes an acceptable risk. National safety standards and codes define the level of risk which our industrial society considers acceptable. In research safety, the intent of national safety standards and codes frequently must be extrapolated into virgin areas. The integrity with which this extrapolation is performed is a major determinant of management's safety posture. Management's safety posture is subjected to test after test in research work. Frequently, there is a very definite limit on the time and money that can be devoted to a particular research effort because of the limited technological advancement which the research effort is capable of yielding. Such a time and financial limit dictates how much quantitative safety information can be generated and how much money can be devoted to facilities costs. This, in turn, establishes a risk level for the research program. Research management must determine whether the risk

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is acceptable. If it is not, research management must have the courage to say "no."

In addition to establishing the "acceptable risk level," research management contributes to its safety posture by condoning or not condoning deviations from the acceptable risk level. If deviations are condoned, the management safety posture slumps and becomes vague and indefinite.

It should be noted that a few written words termed "safety policy" do not necessarily constitute management's safety posture. The true safety posture is evidenced by deeds and example. It is forged in the pressure system of competition and economics wherein firmness and uprightness can sometimes require major financial sacrifices.

The second important factor is recognition that the *individual researcher is the key to safety* in research activities. Two considerations are of major significance in this regard: (1) Many of our educational institutions fail to instill a positive safety attitude during the scientists' most formative years and, as a consequence, an attitude of indifference toward safety must be overcome; and (2) research scientists and research technicians tend to be very individualistic by nature.

Hence, they must be "sold" on safety on an individual basis. If safety rules and regulations are instituted without sufficient discussion and explanation, instant and intense resistance is likely to be encountered. The most effective means of "selling" safety to research personnel is to have them personally participate in all phases of their safety program. A safety committee comprised of research personnel can effectively conduct safety inspections, promulgate their own safety rules, review new operations and equipment for safety features, establish safe job methods, and perform other safety program activities.

The third important factor is *quantitative facts.* Research personnel must have quantitative information about the potential hazards of the work they are to perform. Opinions and qualitative evaluations are not adequate. Lord Kelvin expressed this need very eloquently in these words:

> "I often say that when you can measure what you are speaking about, and express it in numbers, you know something about it, but when you cannot measure it, when you cannot express it in numbers, your knowledge is of meager and unsatisfactory kind; it may be the beginning of knowledge but you have scarcely, in your thoughts, advanced to the stage of Science, whatever the matter may be."

Frequently, quantitative facts concerning the materials, reactions, or emissions involved in a particular research effort will not be readily available. Such quantitative knowledge must be developed before research personnel are exposed to undefined and possibly serious hazards.

The fourth important factor is *facilities*. There is no substitute for adequate facilities if hazardous research is to be undertaken. Quantitative facts regarding the potential hazards of a particular research effort form the basis for determining what facilities are required to perform the research work safely. Laboratory hoods, glove boxes, safety shields, remotely controlled operations, protective structures, containment devices—all have special applications in research safety.

II. Solid Propellant Scale-Up From Laboratory Phase to Pilot Plant Manufacture

As a case study to illustrate the application of these four safety factors, I have selected the development of a propellant which incorporates beryllium powder as a fuel.

For several years Atlantic Research has been engaged in research and development of composite solid propellants incorporating beryllium powder as a fuel. This work has now progressed from laboratory phase to pilot plant manufacture. The safety problems involved in this effort are very illustrative, because both explosive and toxic hazards are involved. A typical formulation which is of primary interest from the safety standpoint includes as ingredients dry nitrocellulose in powder form; liquid plasticizer similar to nitroglycerin; dry, powdered ammonium perchlorate; and dry beryllium powder. These ingredients are mixed together with other relatively inert ingredients by mechanical mixers similar to large food mixers. The mixed propellant is in semi-fluid form at the completion of mixing. It is then cast in a motor case and is cured at an elevated temperature for a period of time. (Also, small samples are usually cured for use in laboratory tests to determine burning rate, physical properties, and sensitivity.) The rocket motor can then be static test fired to evaluate the performance characteristics of the propellant.

The toxic hazards associated with beryllium and its compounds are primarily those of the inhalation of these materials. Both the metallic fuel powder used in propellant formulations, and the beryllium oxide fumes generated by the combustion of the propellant, constitute copious sources for such respirable aerosols. It is therefore necessary to monitor and control not only in-plant atmospheres, but those in the plant environment as well. Releases of beryllium-containing

fumes to the atmosphere, as by open-air static firing of motors, can be done only at remote sites, and under carefully defined meteorological conditions.

Prior to beginning work with beryllium-containing propellants even at the laboratory stage, the potential hazards were carefully evaluated and a management decision was made regarding the levels of acceptable risk. Safety standards are readily available for propellant and explosives work in the form of military ordnance safety standards. Safety standards for beryllium work have been developed by the Atomic Energy Commission. These two basic sets of standards were adopted as risk level criteria for the research effort.

Once these standards were adopted, it was immediately evident that special control measures and new facilities were necessary.

Control measures included a thorough preplacement physical examination for each person assigned to work on the project and reexamination at least annually. A complete clothing change was required for all personnel working with beryllium. This necessitated a suitable change room with shower facilities. A laundry was needed so that work clothing could be washed under controlled conditions. Strict control of tools, equipment, and materials was necessary to prevent inadvertent removal of beryllium-contaminated objects from the plant. A complete sampling program had to be instituted. This program included perimeter and in-plant air sampling, and water, soil, and vegetation sampling.

A safety committee was formed for the operation. Personnel were given instruction and training in safe job methods. Safety rules and procedures were established and implemented. Written operating procedures were used as a basis for planning, evaluating, and controlling operations. Each new operation was performed initially using aluminum powder instead of beryllium powder as a means of checking safeguards.

The new facilities required for the project were built at the Atlantic Research Pine Ridge Plant, which is a 588-acre site located near Gainesville, Va., in a sparsely populated area of Prince William County (Slide 1). (See pp. 319–329.) A laboratory was constructed to perform the initial laboratory-scale work (Slide 2). Hoods, glove boxes, and exhaust systems were needed for beryllium work. Protective test cells were needed to facilitate remote-control mixing, curing, and testing of propellant.

The first step was manufacture of small test motors containing one-fourth pound of propellant. The propellant was mixed by remote-control operation in an Atlantic Research Model 35 Z-blade, 1-pint laboratory mixer (Slide 3). The small test motor was fired in a closed

vessel. This laboratory-scale work provided experience in processing propellants containing beryllium, and provided samples of propellant which could be used to develop quantitative facts regarding the potential hazards involved. Impact sensitivity, autoignition temperature, and chemical stability data were collected to assess potential explosive hazards. Animal experiments were begun to evaluate toxicity hazards from beryllium propellant combustion products.

The first scale-up was manufacture of 10-pound test motors. Facilities had to be expanded to afford quantity-distance separations and to facilitate remote-control operations on a larger scale (Slide 4). The 10-pound motors were mixed in a 20-quart vertical mixer housed in a separate process building (Slide 5). The test motors were fired in a large static-test tunnel (Slide 6). At the downstream end of the tunnel a Pease-Anthony venturi scrubber exhausts the tunnel of rocket fumes and cleans these fumes of particulate matter before discharging them to the atmosphere through an effective 100-foot stack.

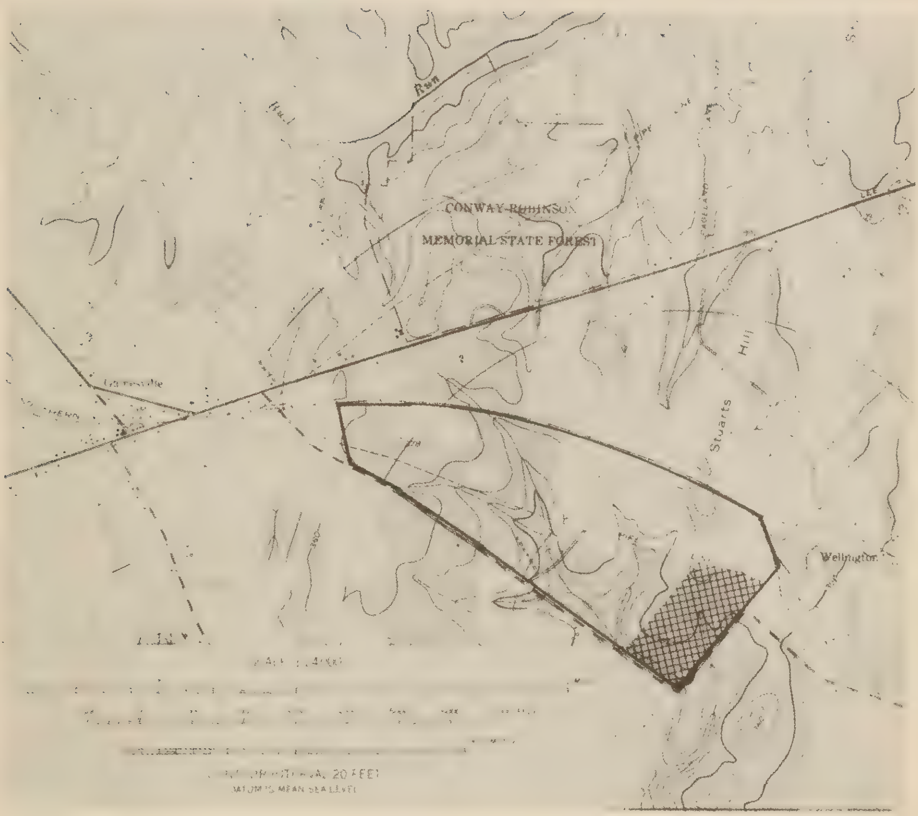
The second scale-up was manufacture of 50-pound test motors. The facilities used in the 10-pound program were suitable for the 50-pound program.

The third scale-up was manufacture of 150-pound test motors. Quantitative analysis of the protection afforded by the large static-test tunnel revealed that the tunnel might not contain the explosive effects if the 150-pound motor exploded. The risk involved in test firing the motor at the Gainesville location became unacceptable at this scale. Therefore, another location and another facility were necessary for this scale-up.

A site was selected on the outer banks of North Carolina (Slide 7). A static-test stand was installed and open-air firings were made. The open-air firings must be performed only when meteorological conditions are favorable. Hence, in addition to neighborhood and in-plant air sampling programs, a meteorological station was provided and many quantitative calculations of turbulent atmospheric diffusion were performed to establish acceptable meteorological conditions. The 150-pound test motors were successfully static-test fired in the open.

The next scale-up was manufacture of a prototype rocket motor containing several thousand pounds of propellant. This necessitated construction of a manufacturing plant at the Outer Banks location (Slide 8). Mixing for this large motor is done by a 75-gallon vertical mixer (Slide 9). The size of this motor is in sharp contrast to the first one-fourth-pound test motor (Slide 10—Large Motor in Test Stand; Slide 11—one-fourth-pound test motor hardware). This large motor was recently manufactured and static-test fired.

In this discussion, progression from laboratory stage to pilot plant manufacture has been very rapid. The actual scale-up has taken considerable time and we have committed considerable company resources and customer funds to this program. However, we have accomplished the scale-up without a single disabling injury being caused by the beryllium or the explosive hazards. Personnel who work in this program participate actively in their safety programs and merit a large share of the credit for our success. We developed the quantitative safety information needed at each stage to assure ourselves that we were not exceeding our acceptable risk level. The part facilities have played in this safety success story is clearly evident from the slides. We have maintained our original management concept of acceptable risk level—with the full support of our customers.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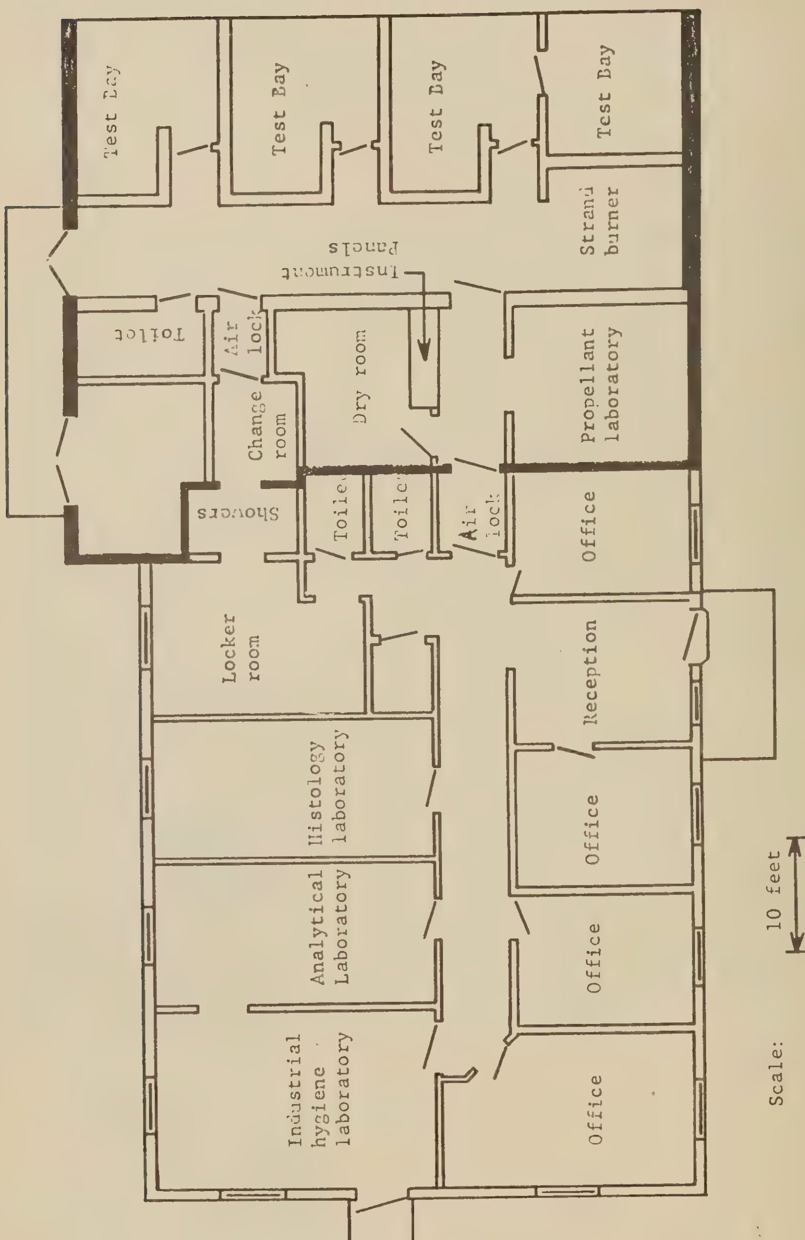

SLIDE 2 - Floor Plan, Laboratory and Office Building


ATLANTIC RESEARCH CORP
ALEXANDRIA VA

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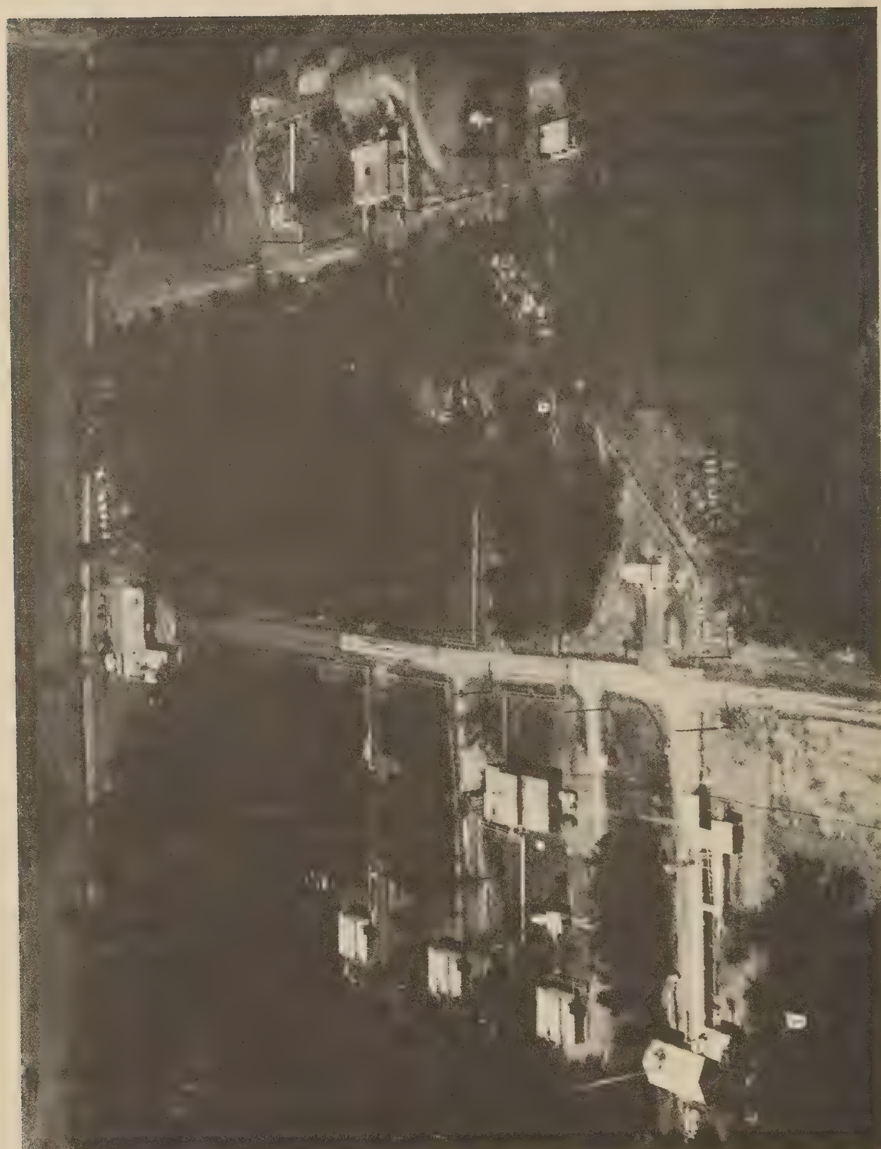
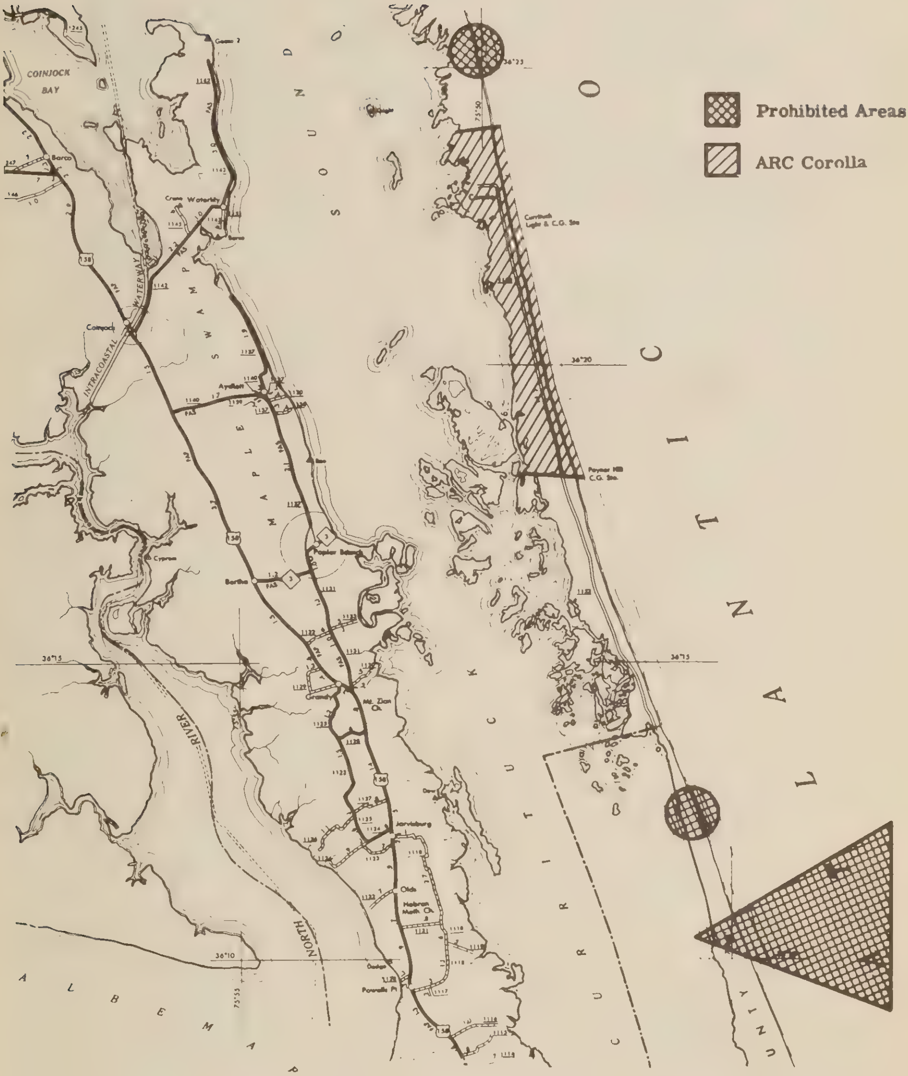
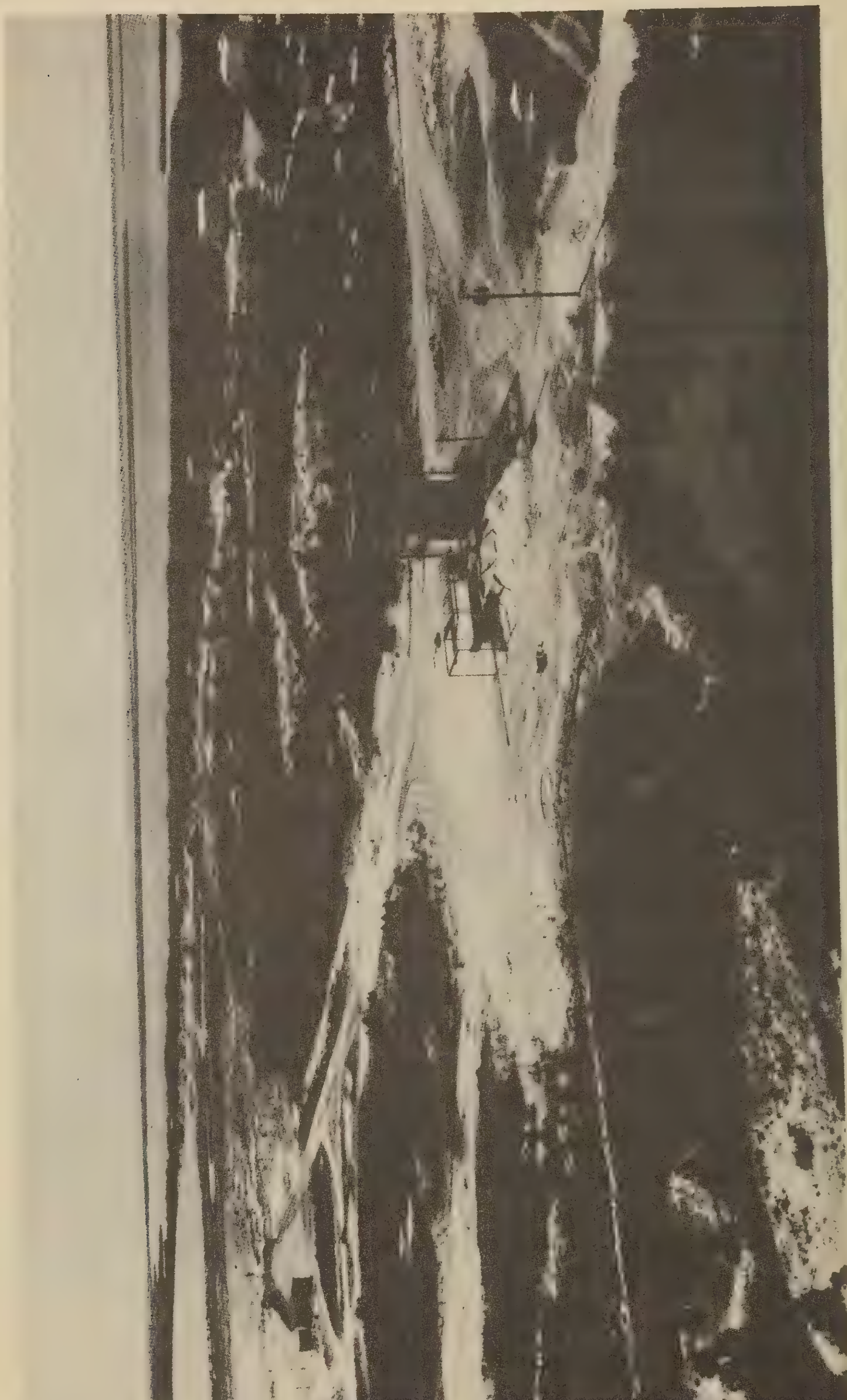


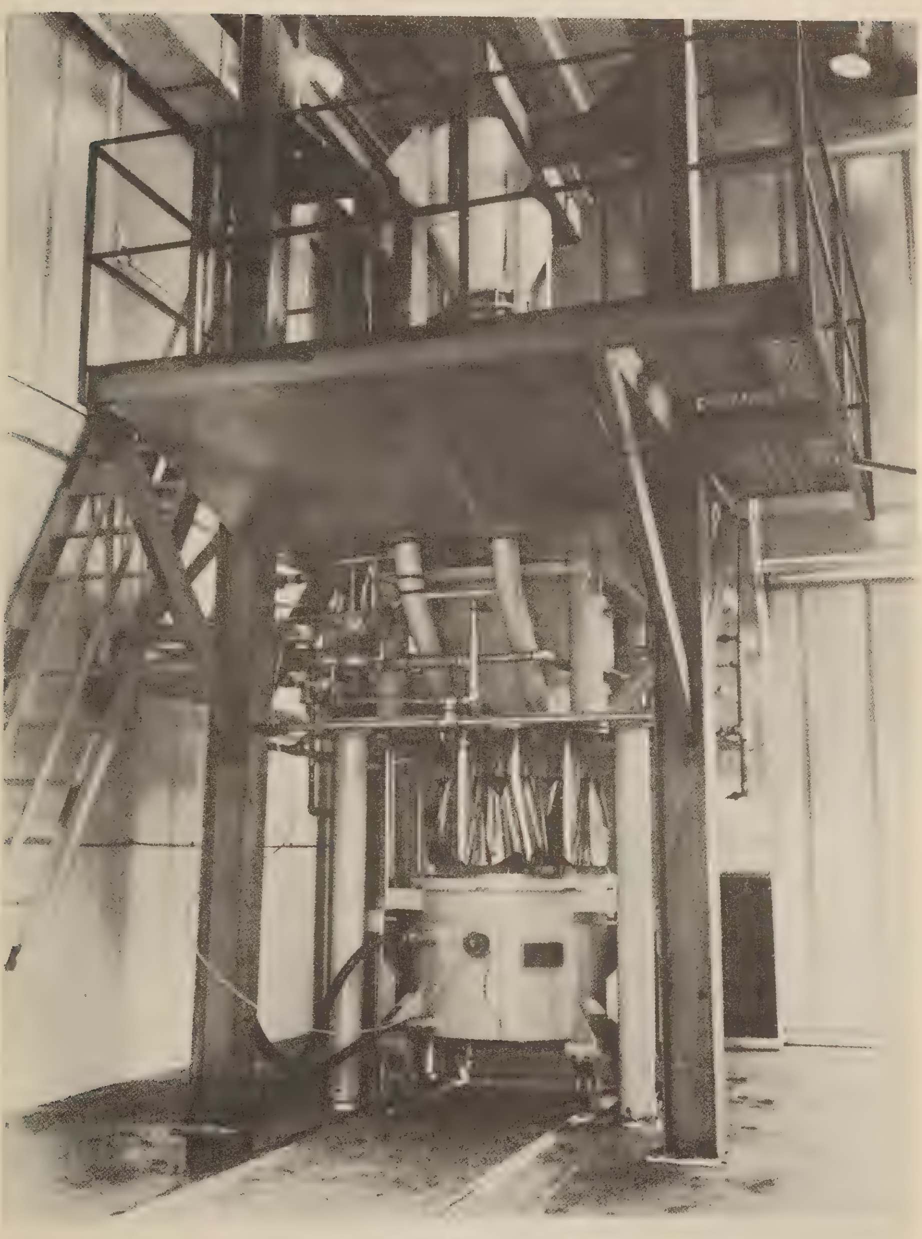
SLIDE 6 - Static-Test Tunnel



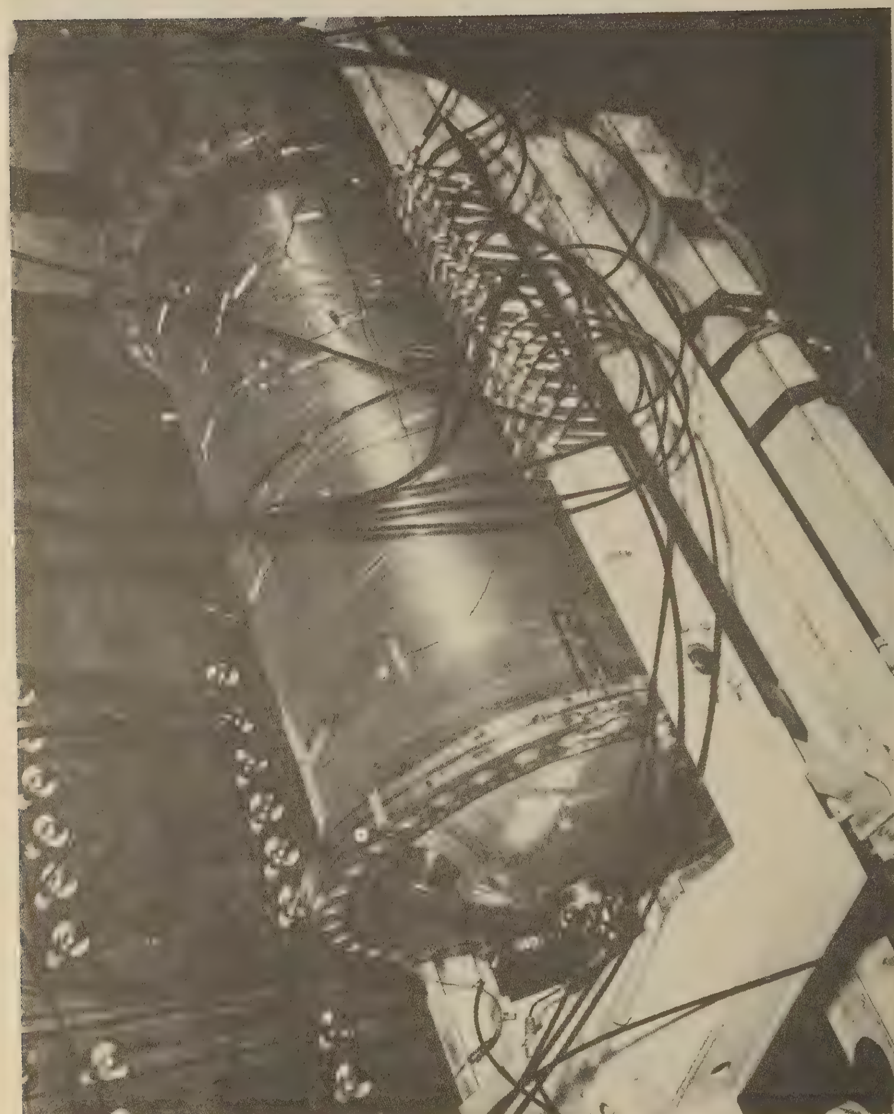
SLIDE 7 - Atlantic Research Corporation
Corolla Vicinity and Surrounding
Areas

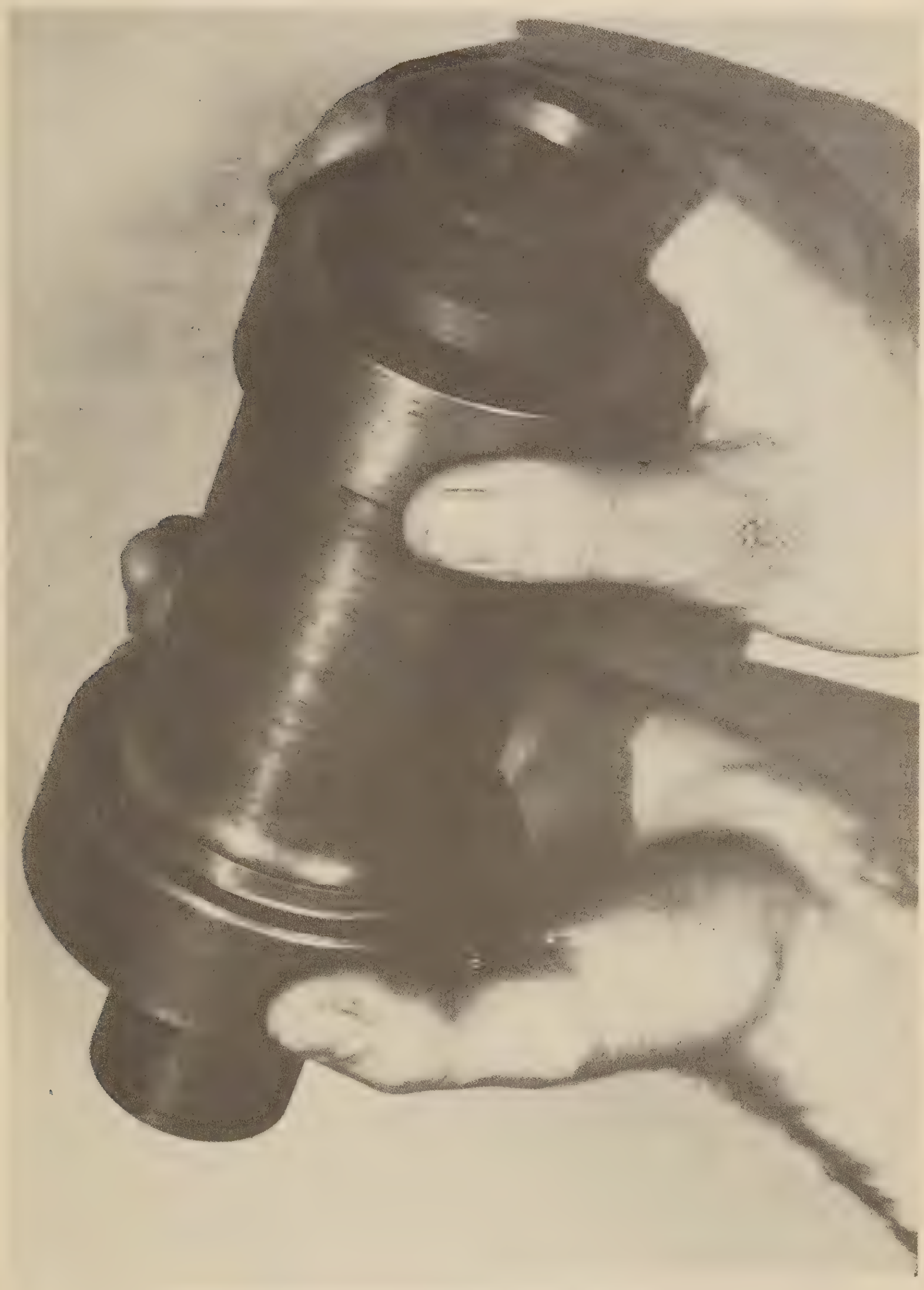


SLIDE 8 - Static Test Stand,
Outer Banks Facilities



[illegible] Vertical Mixer





SLIDE 11 - 1/4-Pound Test Motor Hardware

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A Bibliography for R&D Safety

W. S. Wood, *Safety Engineer, Research & Development, Sun Oil Company, Marcus Hook, Pa.*

The complexity of modern research increases the problems of safety and fire protection in the laboratory. Safety personnel are called upon to solve these problems as they arise. Since information is essential to the interpretation of findings and the selection of procedures, a bookshelf of safety information can be a most valuable asset. The choice of these sources of information is based upon day-to-day experience. Howard Fawcett, safety consultant for the Research Laboratory of the General Electric Company, has concurred with me in compiling a short bibliography listing the reference material we have found useful to us. We have prepared a sufficient supply of these to distribute to this audience and to fulfill limited requests following this conference.

Omission of any book does not necessarily mean that it is of no value, but only that we have not utilized it to any extent. Since research covers an ever-expanding field of scientific endeavors, it would be impossible to list all of the sources which each of you would find useful. This bibliography is, therefore, a possible starting point for the assembling of a reference bookshelf on safety in research.

Selected Bibliography on Safety in Research and Development [1]

This sample bibliography is intended to illustrate the wide diversity of information, both in content and source, which has a direct bearing on accident prevention. Since accident prevention involves both people and their environment, references to both are included as guides to a more specific study. It is suggested that reference librarians in larger libraries can be of assistance, even in highly specialized research fields.

ACCIDENT PREVENTION—General

Accident Prevention Manual for Industrial Operations, Fourth Edition, 1959 45 Chapters (Fifth Edition will be available about October 1964), National Safety Council, 425 North Michigan Ave., Chicago, Ill., 60611.

Safety Management, by Simonds and Grimaldi, 555 pages, published by R. D. Irwin, Inc., Homewood, Ill., 1956, $7.80.

Safety Guide for Unions, 225 pages, 1962, National Safety Council, 425 North Michigan Ave., Chicago, Ill., 60611, $7.90.

Safeguarding Research, by H. H. Fawcett, *National Safety News*, *64*, 5, pp. 18 ff. (December 1951).

[1] Prepared by W. H. Fawcett and W. S. Wood.

Safety Program Is Full-Time Job, E. Allen, *Chemical Engineering*, 67, 23, pages 246–248–250 (Nov. 14, 1960).

Occupational Safety and Health Abstracts, Published monthly in card and bulletin form by International Occupational Safety and Health Information Center (CIS), International Labour Office, Geneva, Switzerland, available by subscription.

Selected Publications of the Bureau of Labor Standards, U.S. Department of Labor, 23 pages, November 1962 (Available from Bureau of Labor Standards, Washington, D.C.).

1964 National Directory of Safety Films, 64 pages, National Safety Council, 425 North Michigan Ave., Chicago, Ill., 60611, $2.80.

Public Health Service Film Catalog, 1963, Pub. No. 776, 49 pages, U.S. Department of Health, Education, and Welfare, Public Health Service, Communicable Disease Center, Atlanta 22, Ga.

National Safety News, monthly, published by National Safety Council, 425 North Michigan Ave., Chicago, Ill., 60611.

AEROSPACE AND AVIATION

a. Propellants

Incident Summaries, distributed by Armed Services Explosives Safety Board, Department of Defense, Washington, D.C., 20315.

The Handling and Storage of Liquid Propellants, Jan. 1963, Office of the Director of Defense Research and Engineering, 338 pages, U.S. Government Printing Office: 1963, $1.75.

Testing with Storables, by D. M. Tenenbaum, ARS Paper 1263–60 (American Institute of Aeronautics and Astronautics, 1290 Avenue of the Americas, New York City).

Research on the Hazards Associated with the Production and Handling of Liquid Hydrogen, by M. G. Zabetakis and D. S. Burgess, Explosive Research Laboratory, Bureau of Mines, Pittsburgh, Pa., BM–RI–5707.

Evolution of Safety in Design and Operating Procedures for Mixing Solid Composite Propellants, by W. G. Hayden, ARS Paper 2475–63 (A.I.A.A.).

Safety in Solid Propellant Rocket Plants of the United States Army Munitions Command, by C. H. Stanley, ARS Paper 2473–63 (A.I.A.A.).

Amateur Rocketry, 76 pages, 1959, American Rocket Society (A.I.A.A.).

b. Other Aspects

Les Pricipaux Dispositifs de Securite de L'astronaute, by Marcel Golay, *L'Homme et L'Espace*, July 1962, pp. 17–23.

The Pilot's Role During Mercury Systems Failures, by J. H. Boynton, Paper 64–222, June 29, 1964, A.I.A.A. Annual Meeting, Washington, D.C.

Crew Safety System Aspects of Booster Flight Testing, by J. P. Kuettner, Paper 64–323, July 1, 1964, A.I.A.A. Annual Meeting, Washington, D.C.

Flight Recorders in Accident and Incident Investigation, by J. F. Pahl, Paper 64–351, July 1, 1964, A.I.A.A. Annual Meeting, Washington, D.C.

Safety of Nuclear Systems in Space Applications by C. M. Barnes, *Military Medicine*, Vol. 128, August 1963, pp. 766–768.

Aerospace Nuclear Safety, by J. A. Connor, Jr., *Aerospace Medicine*, Vol. 31, October 1960, pp. 797–806.

SNAP Aerospace Safety Program, Quarterly Technical Progress Report, July–September 1962, L. I. Moss, *NAA–SR–7797*.

Range Safety—a necessary evil, by A. K. Knothe, *Aerospace Engineering*, Vol. 20, June 1961, pp. 20, 21, 70–76.

Atmospheric Turbulence in Relation to Aircraft (Proceedings of a Symposium at the Royal Aircraft Establishment), Available from British Information Services, 845 Third Ave., New York 22, N.Y., $6.

CHEMICAL SAFETY

Unfalle Beim Chemischen Arbeiten, by Rust and Ebert, 345 pages, 1948, Rascher and Cie A. G., Zurich, Switzerland (in German), $21.

Manual of Hazardous Chemical Reactions, approximately 110 pages. Available about Sept. 1, 1964, National Fire Protection Asso., 60 Batterymarch St., Boston 10, Mass. (Price to be announced.)

Safety and Accident Prevention in Chemical Operations, Fawcett and Wood, Interscience Division, John Wiley & Sons, New York (in preparation, available about October 1964).

Eye Protection in the Chemical Industry, A Report on Six Years' Experience, by R. E. Joyner, *Ind. Med. & Surg.* 28, 174–177 (April 1959).

Recent Advances in Chemical and Radiological Safety, Proceedings of Apr. 22, 1964 Conference, sponsored by Chemical Section, National Safety Council and others. Available from H. H. Fawcett, P.O. Box 1088, Schenectady, N.Y., 12301, $5.

Contents:

- Biological Effects of Radiation
- The Role of Labor Standards
- Radiation Control in New York State
- Transportation of Dangerous Cargoes
- Role of the American Chemical Society
- Fire Services Interest in Chemical and Radiological Safety
- A New Fire Fighting Tool
- Communication of Technical Safety
- Recent Chemical Plant Fires
- The LP–Gas Industry Reaction to the Indianapolis Coliseum Accident
- Ultrasonic Detection Techniques for Gas Leaks
- Air-Condensing Cryogenic Fluids Chemical Identification and Preplanning
- Safety with Superpressure Equipment for Diamond-Making

Chemical Safety References, Data Sheet 486 (Rev.), National Safety Council, 425 North Michigan Ave., Chicago, Ill., 60611.

Who Knows What—About Chemical Safety, by H. H. Fawcett, Part I, p. 85A–88A, Indust. & Engr. Chem. Vol. 52, June 1960; Part II, p. 75A–76A, ibid., August 1960.

Selected Bibliography on Safety and Health Papers, Presented at National Meetings of the American Chemical Society 1935–1963 (Unpublished) 17 pages, Prepared for American Chemical Society Committee on Chemical Safety by Emerson Venable, 6111 Fifth Ave., Pittsburgh, Pa.

The Literature of Chemical Safety, by H. H. Fawcett, to be presented for Division of Chemical Literature, American Chemical Society meeting, Chicago, Ill. Sept. 2, 1964.

Chemical Safety Supervision, by J. Guelich, 221 pages, Reinhold Publishing Co., New York, 1956, $4.50.

Numerous Publications of the *Manufacturing Chemists' Association*, 1825 Connecticut Ave., Washington, D.C., 20009.

Safety in the Chemical Laboratory, 16-mm. sound color, 20 minutes; preview, $10 a week; purchase, $100; available from Manufacturing Chemists' Association, 1825 Connecticut Ave., Washington, D.C., 20009.

Chemical Boobytraps, 16-mm. sound color, 10 minutes, free loan, H. H. Fawcett, General Electric Research Laboratory, P.O. Box 1088, Schenectady, N.Y., 12301.

Chemical Section Safety Newsletter, monthly, Chemical Section, National Safety Council, 425 North Michigan Ave., Chicago, Ill., 60611, $2.60 a year.

ELECTRICAL SAFETY

Improvements in Electrical Safety, by C. F. Dalziel, AIEE-Trans. Vol. 81, p. 1 (Comm. & Electronics) No. 60, May 1962, pages 121–127, Paper 61–237.

Safety in Electrical Systems, by A. L. Dowden, *Elec. Constr. and Maint.* Vol. 60, No. 11, November 1961, pages 90–95.

Electrical Safety Guide to Hazardous Process Areas, by R. W. Scott, *Chem. Engr. 68*, No. 14, pp. 123–138 (July 10, 1961).

Threshold 60-cycle Fibrillating Currents, by C. F. Dalziel, *A. I. E. E.-Trans.*, Vol. 79, p. 3 (Power Apparatus and Systems) No. 50, pp. 667–673 (October 1960) Paper 60–40.

Insure Safe Use of Home Electricity, by R. G. Belknap, *National Safety News.* 89, No. 6, pages 76–77 (June 1964) (Includes tables of physiological effects of electric currents).

Maintenance of Electric Motors for Hazardous Locations, data sheet 546, Published in *National Safety News, 89*, No. 6, pages 42–46 (June 1964).

Electrical Ignition of Combustible Atmospheres, by A. H. McKinney, *I. S. A.-Trans.* Vol. 1, No. 1, pp. 45–64 (January 1962).

Heat Transfer and Computational Considerations in Design of Instrument Cases for Operations in Hazardous Atmospheres, by J. A. Buetler and J. A. Clark, *I. S. A. Trans.*, Vol. 1, No. 2, pp. 133–137 (April 1962).

The Spontaneous Ignition Temperatures of Inflammable Gases and Vapours, A Critical Resumé, by H. G. Riddlestone, Tech. Report Reference D/T 110, 18 pages, British Electrical and Allied Industries Research Asso., Leatherhead, Surry, 1958, Price 10/6d.

Intrinsically Safe Process Controls, by W. F. Hickes, *National Fire Protection Association Quarterly*, Vol. 55, No. 4, pp. 361–368 (April 1962).

INDUSTRIAL HYGIENE AND TOXICOLOGY

Toxicity: Killer of Great Chemists? by S. Soloveichik, *Journal of Chemical Education*, 41, pp. 282–284 (May 1964).

Diseases of Occupations, by D. Hunter, Third Edition, 1,180 pages, Little, Brown & Co., Boston, 1962, $28.50.

Progress in Chemical Toxicology, Vol. 1 by A. Stolman, 436 pages, Academic Press, New York, 1963, $14.

Industrial Hygiene and Toxicology, F. A. Patty, Vol. 1, General Principles, 1958, $18.75; Vol. 2, Toxicology, 1962, $40, interscience, John Wiley & Sons, New York, 10016.

Toxicology of the Eye, by W. M. Grant, 641 pages, 1962, C. C. Thomas, Springfield, Ill., $16.50.

Poisoning—A Guide to Clinical Diagnosis and Treatment, Second Edition, by W. F. von Oettingen, 627 pp. W. B. Saunders Co., Philadelphia, Pa.

Toxicity of Industrial Metals, by E. Browning, 325 pp. 1961, Butterworths, London, England, $10.

Textbook of Toxicology, by K. P. DuBois and E. M. K. Geiling, 1959, Oxford University Press, New York, 10016, $6.50.

Toxicity of Industrial Organic Solvents, by E. Browning, Tudor Publishing Co. (Chemical Publishing), New York 3, N.Y. 1953, $8.

Encyclopedia of Instrumentation for Industrial Hygiene, 1,222 pages, 1956, University of Michigan, Ann Arbor.

Respiratory Protection Manual, Joint ACGIH–AIHA, American Industrial Hygiene Association, 14125 Prevost, Detroit, Mich., 1963, $8.70.

Hygienic Guides, available for nearly 100 substances, American Industrial Hygiene Association, 14125 Prevost, Detroit, Mich., 48227.

Toxicity of Beryllium Compounds, by L. B. Tepper, H. L. Hardy, and R. I. Chamberlin, 190 pages, 1961, Elsevier Pub. Co. (D. Van Nostrand & Co., Princeton, N.J.) $4.

Workshop on Beryllium, Jan. 5 and 6, 1961, 111 pages, The Kettering Laboratory, University of Cincinnati, Cincinnati, Ohio.

Industrial Hygiene Digest, monthly literature abstracts for members, Industrial Hygiene Foundation, 4400 Fifth Ave., Pittsburgh, Pa., 15213.

Archives of Environmental Health, monthly, American Medical Association, 535 North Dearborn, Chicago, Ill., 60610.

Journal of Occupational Medicine, monthly, Hoeber Medical Division, Harper & Row, 49 East 33d St., New York, N.Y., 10016, $10 year.

Threshold Limit Values for 1964, American Conference of Governmental Industrial Hygienists, 1014 Broadway, Cincinnati 2, Ohio, 25¢.

American Industrial Hygiene Association Journal, 14125 Prevost, Detroit, Mich., 48227.

Occupational Hygiene Abstracts, monthly, Bureau of Hygiene and Tropical Diseases, Keppel St., London, W. C. 1, $5.60 year.

Quarterly Safety Summary of the Association of British Chemical Manufacturers, British Chemical Industry Safety Council, 15 Kingsway, London, W. C. 2, England.

LABORATORY AND PILOT PLANT SAFETY

Guide for Safety in the Chemical Laboratory, by General Safety Committee of the Manufacturing Chemists' Association, Inc., 234 pages, 1954, D. Van Nostrand Co., Princeton, N.J., $5.50.

Laboratory Safety, by H. H. Fawcett, *Chem. & Engr. News*, 29, 1302–1305 (1951).

Safety and Industrial Hygiene in the Laboratory, by H. H. Fawcett, *Chemistry & Engineering News*, 30, 2588–2591 (1952).

Checklist for Laboratory Safety, by H. H. Fawcett, p. 296, 24, Journal of Chemical Education, June (1947).

Safety Practice for Chemical Laboratories, by G. N. Quam, 78 pages, Villanova Press, Villanova University, Villanova, Pa., 1963, $1.

Laboratory Planning for Chemistry and Chemical Engineering, edited by H. F. Lewis (Chapter VII, Occupational Health and Safety, pages 82–100), Published by Reinhold Publishing Co., New York, 1962, $20.

Occupancy Fire Record—Laboratories—1961, National Fire Protection Association, Boston, Mass.

Laboratory Handbook of Toxic Agents, by C. H. Gray, London: The Royal Institute of Chemistry, 30 Russell Square, W. C. 1, printed in Great Britain at the Works of W. Heffer & Sons Ltd., Cambridge, England, 1960, 170 pages.

MECHANICAL ENGINEERING

Unfired Pressure Vessels, the ASME Code Simplified, by R. Chuse, Fourth Edition, 154 pages, 1960, F. W. Dodge Corp., New York.

Cracking in High-Strength Steel Weldments—a critical review, Battelle Memorial Institute, Columbus, Ohio, Defense Metals Information Center, DMIC Report 197, Feb. 7, 1964.

An Investigation of Midship Bending Moments Experienced in Extreme Regular Waves, by models of the mariner type ship and three variants, Ship Structure Committee, PB 181508, Jan. 15, 1964.

An Investigation of Midship Bending Moments Experienced in Extreme Regular Waves, by models of a tanker and a destroyer, Ship Structure Committee, PB 181509, Feb. 3, 1964.

Mechanical Engineers' Handbook, edited by Lionel S. Marks, sixth edition, 2,153 pages, McGraw-Hill Book Company, Inc., New York, Toronto, London, 1958.

FIRE RESEARCH

Fire Research Abstracts and Reviews, Published periodically since 1959 by the Committee on Fire Research, National Academy of Sciences, 2101 Constitution Ave., Washington 25, D.C.

Fire Research 1962, Department of Scientific and Industrial Research, London, and Fire Officers' Committee Joint Fire Research Organization, Boreham Wood, 1963, 75 pages, H. M. Stationery Office, London, Price 6s.6d.

FIRE AND FIRE PROTECTION

National Fire Protection Association, 60 Batterymarch St., Boston, Mass., 02110. The prime educational and scientific fire protection organization. Consult Fire Protection Publications, 1963–64, 43 pages, available from the NFPA. The following NFPA major publications may be of interest:

National Fire Codes, 1964–65 Edition, In 10 volumes (available fall 1964).
Fire Protection Handbook, 12th Edition, 2,200 pages, $17.50.
Fire Protection for Chemicals, by C. Bahme, 1956, $3.
National Fire Protection Association Quarterly.

Handbook of Industrial Loss Prevention, by staff of Factory Mutual Engineering Division, 74 chapters, McGraw-Hill Book Co., New York, 1959, $20.

Fire Engineering, monthly, 466 Lexington Ave., New York, $5 a year.

GASES—COMPRESSED

The Use and Handling of Compressed Gases, Bulletin 259, 30 pages, 1963, U.S. Government Printing Office, Washington, D.C., 20402, 15¢.

Various publications of the *Compressed Gas Association, Inc.*, 500 Fifth Ave., New York, N.Y., 10036 (Including "Safe Handling of Compressed Gases").

Matheson Gas Data Book, 420 pages, 1961, *The Matheson Co., Inc.*, E. Rutherford, N.J.

Your Compressed Air: Fit to Breathe?, by F. S. Venable and E. D. Polick, *National Safety News*, *89*, 28–32 (April 1964).

NOISE CONTROL

Industrial Noise Manual, 11 chapters, 1958, American Industrial Hygiene Association, 14125 Prevost, Detroit, Mich., 48227, $7.50.

Noise Reduction, Edited by L. L. Beranek, 752 pages, McGraw-Hill Book Co., Inc. New York, 1960.

Handbook of Noise Measurement, Fifth Edition, by A. P. G. Peterson and E. E. Gross, Jr. General Radio Co., West Concord, Mass., $1.

Industrial Deafness, by J. Sataloff, 350 pp., 1956, McGraw-Hill Book Co., New York, $10.

Noise Measurement and Noise Control, by S. E. Pihl, pp. 15–20, and Hearing Protection in Industry, by R. B. Maas, pp. 21–26, *Journal of the American Society of Safety Engineers*, April 1964.

OCCUPATIONAL HEALTH

1964 Industrial Nursing—Challenges of the Future, by E. Watson, *American Association of Industrial Nurses Journal*, March 1964, pp. 16–19.

Occupational Health Nursing, by M. L. Brown, 276 pages, 1956, Springer Publishing Co., New York, 10010.

Occupational Health Newsletter (monthly publication), National Safety Council Occupational Health Committee, 425 North Michigan Ave., Chicago, Ill., 60611.

Broadening Concepts of Industrial Medicine, S. D. Steiner, *American Association of Industrial Nurses Journal*, March 1964, pp. 12–15.

PETROLEUM AND OIL

Various publications of the *American Petroleum Institute*, 1271 Avenue of the Americas, New York, N.Y.

Safety in the Petroleum Refining and Related Industries, by George Armistead, Jr., 484 pages, 1959, John Simonds & Co., 111 John St., New York 7, N.Y., $12.50.

PLASTICS

Fire Hazards of the Plastic Manufacturing and Fabricating Industries, NBFU Research Report No. 1, M65, 119 pages, National Board of Fire Underwriters, New York, 1963.

Plastics Safety Handbook, 1959, Society of the Plastics Industry and National Safety Council; 208 pages, 250 Park Ave., New York, N.Y., 10017, $5.

Explosibility of Dusts Used in the Plastics Industry, Bureau of Mines RI 5791, 1962, Bureau of Mines, 4800 Forbes St., Pittsburgh, Pa.

PSYCHOLOGY

Human Engineering Guide to Equipment Design, by Chapanis, Cook, Lund, and Morgan, 1963, McGraw-Hill Book Co., New York, 640 pp., $9.99.

RADIATION—NON-IONIZING

Some Technical Aspects of Microwave Radiation Hazards, by W. W. Mumford, *Proceedings of the I. R. E.*, Vol. 49, pp. 427–447 (February 1961).

Electromagnetism and Its Effect on the Organisms, by G. H. Mickey, *New York State Journal of Medicine*, 63, pp. 1935–1942 (July 1, 1963).

Infrared for People Heating, pp. 45–46, *Safety Engineering*, Vol. 127, No. 2, February 1964.

Lasers and Masers, by T. H. Maiman, *Industrial Research*, June 1964, pp. 52 ff.

Laser Seen as a Potentially Useful Tool, But Scientists Hear Warning of Hazards, p. 35, *J.A.M.A.*, Vol. 188 (June 15, 1964).

RADIATION—IONIZING

Scientific American, Vol. 201, No. 3, pages 74–232 (September 1959) (Nine review articles).

Numerous publications of the U.S. Atomic Energy Commission, Washington 25, D.C.

Man-Made Transuranium Elements, by G. T. Seaborg, 120 pages, Prentice-Hall, Englewood Cliffs, N.J., 1963, $1.50.

The Taming of Plutonium, pages 15–18, and *Hot Laboratory and Special Handling Equipment*, pages 19–30, *Atomics*, Vol. 16, No. 3, May–June, 1964.

The Effects of Nuclear Weapons, 1962, Prepared by the U.S. Department of Defense, Published by the U.S. Atomic Energy Commission, 730 pages, U.S. Government Printing Office, Washington, D.C., 20402, $3.

Shielding Against Gamma Rays, Neutrons, and Electrons from Nuclear Weapons, a review and bibliography by J. H. Hubbell and L. V. Spencer, National Bureau of Standards Monograph 69, Feb. 24, 1964, 36 pages, 30¢ (Includes 485 references).

Administrative Experience with Decontamination of Vacated Radiation Installations, by M. Kleinfeld and A. Abrahams, *Journal of Occupational Medicine*, Vol. 6, No. 6, pages 255–261 (June 1964).

Handbooks on Radiation and Radioactivity, issued by the National Bureau of Standards, U.S. Department of Commerce. For complete listing, write National Bureau of Standards, Washington, D.C. For sale by U.S. Government Printing Office, Washington, D.C., 20402.

Radiation in Perspective, 16-mm. sound color movie, 43 minutes, available on loan from regional offices of the U.S. Atomic Energy Commission, or from Motion Picture Section, U.S. Department of Agriculture, Washington, D.C.

Radiation, 16-mm. sound color movie, 26 minutes, produced in 1962 by National Film Board of Canada, 680 Fifth Ave., New York; or Ottawa, Ontario, Canada.

Sourcebook on Atomic Energy, by S. Glasstone, Second Edition, 641 pages, 1958, D. Van Nostrand Co., Princeton, N.J., $4.40.

Radiation Safety in Industry, by M. Kleinfeld, *Journal of Occupational Medicine*, April 1964, pp. 179–183.

Environmental Radioactivity, by M. Eisenbud, 430 pages, 1963, McGraw-Hill Book Co., New York, $12.50.

Harmful Effects of Ionizing Radiation, by E. Browning, 158 pages, 1959, Elsevier Publishing Co. (D. Van Nostrand Co., Princeton, N.J.).

STATIC ELECTRICITY AND COMBUSTION

Electrostatics in the Petroleum Industry, by A. Klinkenberg and J. L. Vander-Minne, Elsevier Publishing Co. (D. Van Nostrand, Princeton, N.J.) 1958, $7.

Static Electricity in Hospital Operating Suites: Direct and Related Hazards and Pertinent Remedies, by P. G. Guest, V. W. Sikora, and B. Lewis, U.S. Department of the Interior, Bureau of Mines Bulletin 520, 58 pages, 1953, U.S. Government Printing Office, Washington, D.C., 20402, 40¢.

Static Electricity and *Flame Propogation*, both 16-mm. sound color-movie, 30 minutes each, American Gas Association, 460 Lexington Ave., New York.

Combustion, Flames, and Explosions of Gases, by B. Lewis and G. VonElbe, 731 pages, Academic Press, New York, 10003, 1961, $22.

Limits of Flammability of Gases and Vapors, by H. F. Coward and G. W. Jones, U.S. Department of the Interior, Bureau of Mines Bulletin 503, 1952, Bureau of Mines, 4800 Forbes St., Pittsburgh, Pa.

Explosition Limit Phenomena and Their Use in Elucidation of Reaction Mechanisms, by W. Roth and M. Scheer, pages 85–103, Advances in Chemistry Series No. 20, American Chemical Society, 1958.

Detonation, 16-mm. sound color movie, 10 minutes, American Oil Co., 332 South Michigan Ave., Chicago, Ill.

TRAFFIC AND MOTOR VEHICLE SAFETY

Highway Design and Traffic Engineering, by Rex M. Whitton, pp. 11–15, *Journal of the American Society of Safety Engineers,* Vol. IX, No. 6, June 1964.

Vehicle Safety and Design, by A. L. Haynes, pp. 16–20, *Journal of the American Society of Safety Engineers,* Vol. IX, No. 6, June 1964.

Research on Road Safety, Department of Scientific and Industrial Research, Road Research Laboratory, 614 pages, published in 1963. British Information Services, 845 Third Ave., New York, 10022, $8.40.

Traffic Safety Research, Quarterly Publication by the Research Department, National Safety Council, 425 North Michigan Ave., Chicago, Ill., 60611.

Recent Findings on Autos and Alcohol Prod Safety Experts To Look Deeper, by R. Hermann, pages 1 and 12, *The National Observer,* Vol. 3, No. 24, June 15, 1964.

STANDARDS, LAWS AND CODES

T. C. George, Interstate Commerce Regulations for Transportation of Explosives and Other Dangerous Articles by Land and Water in Rail Freight Service and by Motor Vehicle (Highway) and Water (Including Specifications for Shipping Containers). Tariff No. 15, 1963, Bureau of Explosives, Association of American Railroads, 63 Vesey St., New York, N.Y., $7 (includes supplements for 3-year period).

Safety and Health Standards for Federal Supply Contracts, 41 CFR Part 50–204—Safety and Health Standards for Federal Supply Contracts, with proposed changes reprinted from the *Federal Register* of October 1, 1963, U.S. Department of Labor, Wage and Hour and Public Contracts Divisions, Washington 25, D.C.

Federal Law 10 CFR 20 (Title 10, Atomic Energy, Chapter 1), Atomic Energy Commission, available from Division of Licensing and Regulation, U.S. Atomic Energy Commission, Washington 25, D.C.

Code of Federal Regulations, Title 46—Shipping, Parts 146 to 149, Coast Guard, U.S. Department of the Treasury, 890 pages, revised as of Jan. 1, 1964, U.S. Government Printing Office, Washington, D.C., 20402, $2.50. Semiannual supplement, as of July 1, 1964, will be issued in a separate binding.

Respiratory Protective Devices Approved by the U.S. Bureau of Mines, I. C. 7885, October 1958, with new approval lists to Jan. 1, 1964, Bureau of Mines, 4800 Forbes St., Pittsburgh, Pa.

NOTE: In addition to Federal Regulations, the numerous State and local codes, laws, and ordinances should be consulted.

WORKSHOP: AGRICULTURAL LEADERSHIP, ITS ACHIEVEMENTS AND OPPORTUNITIES

Moderator: Russell E. Heston, *Chairman, National Conference for Farm Safety; Director of Engineering, Grinnell Mutual Reinsurance Co.*

Working Together

Dr. Lloyd H. Davis, *Administrator, Federal Extension Service, U.S. Department of Agriculture*

I am sure that all those participating in this Conference are well acquainted with the statistics about accidents and hazards to people on the farm. I am sure that I need not remind you that annually agriculture has more accidental work deaths than any other occupation. And agriculture has the third highest accidental death rate of any major occupational group.

I asked a member of our staff who takes leadership in the Federal Extension Service in the safety field for his analysis of the reasons for this. He, of course, cited the fact that farm people are exposed to many hazards in the use of machinery and equipment, in the use of hazardous chemicals and in other ways.

But he emphasized that farmers receive relatively little on-the-job training when they undertake new tasks or obtain new equipment. He pointed out that such training as they do receive frequently lacks an emphasis on the hazards and the necessary safety precautions. He emphasized that in much farmwork the individual works alone or in very small groups where safety supervision is impractical or difficult. He stressed that since each farmer is his own boss and an individual businessman there is no systematic method of reminding individuals of the need for periodic checking of hazards. He mentioned that much farmwork is done by children. The children frequently accompany their parents on the job. The equipment and materials that constitute a hazard to children are frequently distributed about the farmstead. The farmer frequently becomes accustomed to the hazards of the farm and is not aware of the need of giving important safety instruction to his children and his hired labor. He

Paul C. Johnson, Editorial Director, *Prairie Farmer*, discusses the role of farm leaders in Conference workshop on safety in agriculture.

stressed that isolated farmworkers do not have the opportunity for being warned of impending danger that they would have if working in groups. Help in case of an accident is frequently delayed.

I am sure that each of you could add to this list of factors contributing to high accident rates on farms. It seems to me that these factors I have mentioned emphasize that on the farm, as in perhaps no other business, the individual farmworker has a direct personal responsibility for safety.

I am reminded, too, of the time that I was traveling with my family—I rounded a curve in the road and came upon a car that had just turned over. I was the first upon the scene of two badly injured people lying in the ditch. For a time after that, I was very safety conscious. I suspect that after a serious accident in a farm community the people of that community become safety conscious for a period of time. As we discuss greater safety on the farm we must consider the development of attitudes by farm people and farm workers. It seems to me our goal is to develop a constant awareness of hazards, a sensitivity to impending danger. We seek action by people to prevent, eliminate and reduce hazards that is almost as automatic as doing the job itself.

The development of such attitudes is something that is not accomplished by one period of instruction, by one serious accident in the community, by one letter, one newspaper article or one movie on the subject of safety. Such attitudes and points of view develop over time as the result of many experiences. Such attitudes are the result of repeated impressions received in many ways.

All of us here today have a concern in this problem. All of us have a contribution to make in overcoming the problems of safety on the farm. Our program for this morning illustrates the wide range of individuals and groups who have some relationship to developing greater safety. It seems to me that the question we face is the question of how we can work together so as to be most effective in creating this attitude of safety, this awareness of hazards, and the almost automatic action to help avoid risk.

Within the Extension Service in most States we have a staff member who has a special responsibility for leadership in safety. An important function of this staff member is to always be thinking of safety, to be constantly reminding other staff members to include in what they are doing instruction on safety precautions and to point out hazards to safety that are along the way. Through such a safety specialist, we help to build safety instruction into all we do. We help to provide repeated reminders of safety to the farm people with whom we work.

All of the groups represented here work together with farm and rural people. We work together in many ways. It seems to me that in our discussions today we might well face the question of how we can coordinate our work so that there is provided a continuing series of impressions that result in a safety attitude that is constantly in the minds of farm people.

How can we coordinate and develop our work so that our combined impact is greater than it would be with uncoordinated efforts? Another challenge related to our theme recognizes that each of the groups represented here has a certain leadership role in different phases of the total safety program. We might consider in our discussion how each group can most effectively exert its particular opportunities for leadership while supplementing the special efforts of others.

The theme for this session seems to be a recognition that there is in every community a group of people who have a special interest in safety and in doing something about it. One of our challenges is to *activate* this leadership, *support* this leadership and *help* this leadership as they initiate and carry out activities of their own directed at this safety goal. So we might raise another question: How can we work together most effectively to so activate, motivate and assist the local leadership in making its maximum contributions?

Farm Safety—Our Problem

DR. SAMUEL M. GWINN, *Director of Extension Service, University of Delaware*

It is a real pleasure for me to be present today to take part in this agricultural session of the President's Conference on Occupational Safety. Dean Worrilow requested that I convey his regrets to you for not being able to take part in the Conference. Another important duty at the University, mainly a meeting of the Board of Trustees, made it impossible for him to be here. Not only does the Dean make an outstanding talk, but as many of you know, he uses much good humor to illustrate his points and that always makes for good listening. This is not the Dean's speech—it is mine. I hope you realize I am a substitute, and if a substitute makes one point, he has done a good job.

Nevertheless. I will try to convey to you in a short time some of my thoughts concerning the problems, history, and some of the achievements in the area of farm safety. I hope to cite some examples of cooperation between the National and State Safety Councils in our State which has done much to further an educational program on farm safety.

Need for and Importance of Farm Safety Programs

1. There is a general notion among most people that the modern farm is a comparatively safe place to live, but it remains a dangerous place to work.
2. There were 8,700 farm residents killed in accidents in 1962, about the same as the year before. But there were 3 percent fewer farmers.
3. Death rates increased in all accident classes but work, just as they did nationally, according to the National Safety Council. The farmwork rate had a small decrease while the national rate was unchanged.
4. Farming continues to rank as the third most hazardous occupation. Only mining and construction have higher accidental death rates.
5. Motor vehicle, home, and public accidents, affect farm residents about as severely as other Americans. But work accidents, the smallest classification nationally, on the farm remain second only to motor vehicle accidents.

Safety procedures, developed in other industries, are as necessary on the farm as in other work, if farm safety is to be brought into line with the rest of the Nation.

Supervision of employees is much more difficult on the farm than in a factory. The worker often works alone and an unsafe act may go unnoticed and uncorrected.

Frequently the farm employee is temporary help—an itinerant worker or a student working during the summer. Too often he lacks the proper training and knowledge to work safely.

The farm employer should make an extra effort to be sure that his workers understand their duties and the proper, safe way to operate equipment and handle the materials they use. It cannot be assumed that a high school student can operate a tractor properly because he has a driver's license—no matter how safe a driver he may be.

Farm safety is a full-time job we must work at all year round.

Some of Our Problems

Among farm people in general there is a misunderstanding of the basic purposes of organized safety. They have a general feeling that safety is fine for the industrial plant. Due somewhat, I suppose, to the nature of their work and surroundings, they do not view accidents in terms of themselves. I suspect this attitude is rather characteristic of all human beings since most people tend to blame accidents on someone or something else. The farmer has no boss as in industry—the machine is his boss. He does a variety of jobs every day . . . variety may be the spice of life, but it can also be the kiss of death.

Then, too, we also have inadequate organization and communications among various groups working on rural safety. Coupled with a somewhat loose organization and communication pattern is a real shortage of research and factfinding, which is needed so desperately for developing sound and highly specific educational programs. Weak public relations, scanty publicity, and a package sometimes unattractively wrapped, make it a most difficult job to sell an idea to the rank-and-file people who do not fully support or take an active part in safety work. I feel sure you and I will agree that safety per se is not very exciting or challenging to most people. This is not to minimize the problem or task facing farm leaders, but rather to point up the necessity of facing such issues in order to develop and conduct good safety programs.

Components of a Farm Safety Program

I hope I haven't sounded too pessimistic so far, and if I have, I'm now ready to make a few suggestions as to how we start tackling some of the problems I have just mentioned. Let me briefly mention a few of the components of a good farm safety program.

First, such a program must meet important accident prevention needs.—The day of the "tub-thumping" safety campaign has long since passed and people are looking for specific answers to specific problems. Let me give an example that relates somewhat to this statement that occurred recently in our State.

We have had a rather high increase in traffic deaths as compared to last year. These are occurring quite largely in a few well-defined areas. A traffic safety rally was proposed to bring this condition to the attention of the people in the area. Very few people attended the program, which once again shows that such events are no longer the best means of teaching traffic safety. Contrast this approach with the value of traffic safety programs conducted with 4–H members by the Delaware Safety Council and the State police. Excellent attendance and interested learners made for the success of the program.

Second, the program must be broken into its simple components so the workload can be distributed.—I have a strong feeling that if we can concisely define the important problems and then dissect these problems into manageable units, the resources in terms of people, money, and time can be found for getting the job done.

Third, it must be easily communicated to those for whom it was designed.—Intelligence and educational levels vary greatly among the general public. Action is more likely to take place when specific messages are directed at specific targets suggesting that you do this or this in order to keep that from happening.

Fourth, it must be "salable" to the public.—The "gory" picture of a hand mangled in a cornpicker would not be the best way to prevent future accidents of this type if this were the only method to be used.

Fifth, it must be realistic and consistent with available resources. We can no longer send Jack out to cut down the beanstalk unless he has a real sharp axe and knows exactly the location of his target. We cannot extend ourselves beyond our resources if we expect to do a good teaching job.

Finally, some results should come rather quickly in order to give a sense of accomplishment to all those wonderful volunteers who gave of their time, effort, and sometimes money.

Now, how do we go about designing and carrying out such a program? I'm convinced it can be done if the approach is made through the proper agencies, organizations, and groups.

How To Conduct Educational Programs

Problem identification is the real basis for any educational program. Too often we've been guilty of the "shotgun" approach when we should be focusing our attention on the matters that really count.

I'm a strong believer in using lay committees, but a certain amount of caution needs to be exercised in respect to their use. Such groups can give us valuable ideas, but it is the responsibility of the professional staff to clothe these ideas and initiate the educational action to bring about results.

This is where the importance of the National and State safety Councils really begins to come in. First, let us take a look at the National Safety Council.

1. The Farm Department was organized in 1944 to promote work, home, recreation, and highway safety of farm residents.

2. Conduct sound safety campaigns, provide well-written materials, help organize safety committees, and cooperate with over 200 organizations in promoting farm safety.

3. Forty-six States now have voluntary State rural safety committees or councils which have constant contact with the National Safety Council. These State councils can take full advantage of all assistance available from the National Council.

4. Many States have full- or part-time farm safety specialists working in cooperation with the National Council.

5. Cooperate with USDA, Universities, 4–H, FFA, and farm organizations in planning and conducting sound safety programs.

6. The Farm Department staff will assist any State or local group in planning, developing, and conducting effective rural safety programs. Any State not taking full advantage of the educational assistance

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provided by the Council is missing a real opportunity for sound professional leadership.

State Safety Councils are a vital link between the National Council and the local safety organization.

1. Provide statewide leadership of the highest professional caliber.
   a. Councils are composed of leaders in business, industry, and education. Such councils are noted for getting the right person in the right spot, and I think all of us would agree this is necessary, if the job is to be done.
2. Design good programs in cooperation with other agencies and groups.
   a. Slow Moving Vehicle Program—now being started in our State in cooperation with farm organizations and State highway department will consist of billboards for general public, exhibits for general public, exhibits for farm people, and leaflets to all people.
3. Develop and support safety legislation.
   a. Driver education is the only law that I know of in our State that was supported wholeheartedly by all Home Economics, 4–H, and agricultural groups. We worked and lobbied for its passage, and we've had an excellent program for many years.
4. Provide finances.
   a. Financial assistance is given in helping groups develop educational material, exhibits, and in our case, 4–H scholarships are given to educational events to outstanding 4–H safety club members.
5. Obtain support of public.
   a. The professional and volunteer staff of these councils can open doors that most people cannot open, and I've found them to have very good relations with the mass media.
6. Coordinate activities of agencies and groups.
   a. This coordinating function is one of the most important. Every team needs a driver and the safety council in our State performs this function extremely well. One of our problems is to keep everyone concerned with a program headed in the right direction and working toward the same goal.

Conclusion

Safety is primarily the responsibility of the individual. Control of the environment, the removal of hazards and legislation can only go so far. There is a minority of people who have and will continue to violate well-known safety laws and principles; however, the majority of people can be encouraged and educated to accept the responsibility

for safety. These people need help. We know that sound educational programs, based on needs and supported by knowledgeable facts are effective in reducing accidents. Such conferences as these, with the cooperation of groups like national and State councils can and will make progress. Accidents can be prevented and we have a moral responsibility to do so.

The Role of Industry—In Farm Safety

BRUCE LOURIE, *Vice President for Farms, National Safety Council*
(Vice President, Deere & Co., retired May 31, 1964)

It is always a pleasure, but more importantly on this particular occasion it is a privilege, for me to address this group. I have always enjoyed talking to, listening to, and visiting with safety people, especially people whose main interest and concern is farm safety—as mine has been for many years.

Dr. Davis has reemphasized the importance of and the necessity of our "Working Together," if we are to achieve maximum success. It's a big job—as we all know. Although each one of us in this room knows the importance of all segments of our economy, especially our agricultural economy, working together, it certainly creates new enthusiasm and prompts action *now*, when a person of Dr. Davis' stature, highlights and reemphasizes many of the things we already know but which perhaps we haven't been doing anything about—or at least, not enough. There are just too many other urgent matters crowding us for our time and attention.

As Dr. Davis was speaking, I recalled the advice Clarence Randall gave to his associates, when he was president of Inland Steel Company, when he said: "Don't do the urgent, do the important." That's good advise in safety work—or anything else for that matter.

Dr. Gwinn's talk on "Farm Safety—Our Problem" was a most appropriate followup to Dr. Davis' talk and the challenging questions he raised.

I assume my remarks regarding the "Role of Industry" should be directed primarily to the role of the farm equipment industry. I hope that assumption is correct as the farm equipment industry is the only one I know very much about on a firsthand basis—as the result of having spent 36 years in that industry.

I will divide my remarks into three parts:

First, briefly what the industry has been doing in the past along safety lines. I am sure each manufacturer of farm equipment will continue to do just as much or more, if possible, in the future.

Second, some recommendations regarding developing and coordinating leadership among farm machinery dealers, wholesalers, and manufacturers, especially their local sales and service personnel.

Third, a word about the size of the problem—not to frighten any of you, but rather to emphasize the importance of "Our Job" as Dr. Gwinn pointed out—and the absolute necessity of our "Working Together," as Dr. Davis pointed out, if we are to get our big job done—as promptly and as continuously as possible. As Dr. Davis said, it's not a job we can do once and then consider it done.

To give you some idea of what farm machinery manufacturers have been and are doing now, I want to read the "Foreword" and the first section entitled "General Rule," of the "John Deere Design Data Manual No. 14," subject: "Design for Safety:"

FOREWORD

This Guide for Product Design is issued in furtherance of Deere's interest in safe design of its products. The general rule on page 1 is the key feature of this guide. A clear understanding of this rule and adherence to it will promote significantly the fulfillment of Deere's moral and legal responsibility in regard to designing for the personal safety of the operator and others who may be involved in the use of Deere tractors, implements and equipment.

The examples of hazards and precautions commencing on page 2 are illustrative of only a few possible practical applications of the page 1 rule. The engineer should consider them as only exemplary and proceed to apply the rule in each case from his own vantage point, using his ingenuity and experience in discovery of hazards related to the product and development of appropriate safeguards therefor.

Attention is directed to the fact that Government regulations and industry standards may be involved in many questions of safe design. These must be recognized by the engineer in conjunction with the suggestions in this guide. *Preference must be given to Government regulation.*

GENERAL RULE

If reasonably foreseeable activities of the operator of others with, on, or about the product involve risk of accidental bodily injury or property damage, then:

1. Reduce the risk by design* insofar as such precaution is compatible with:
   (a) Necessary function of the product, and
   (b) Reasonable cost relative to seriousness of hazard and total cost of product.
2. Affix warning statement to product in regard to any hazard or degree thereof not eliminated by design under 1 above. As a minimum, affixed durability of the material used for this statement should be as comparable to average life of product as possible. See John Deere Design Data Manual No. 14—Safety Signs.
3. Warn of hazard in Operator's Manual and also where appropriate, in predelivery instructions.

*All reference to "DESIGN" in this Guide contemplates design in its broad sense, namely, specification for material, material treatment, fabrication, etc., as well as design of function.

John Deere Operator's Manuals highlight safety in various places by use of the National Safety Council's "Green Cross" emblem. Many of these books also include a safety page on the inside back cover which reads:

> *Nobody Can Fill Them Like You Can!*
>
> That's what the owner of this pair of work shoes is finding out—the hard way. Through a careless action, he has become the victim of an accident. It's a mighty tough way to find out that nobody else can wear your shoes or practice safety for you. And a needless, costly lesson to learn that safety is an everyday need.
>
> Put safety into each of your workdays; read the operator's manual thoroughly; know how to operate each machine properly and safely; take the safety precautions specified; think before you act.
>
> Make sure you wear your "shoes" everyday. Outfit yourself with a safety program now.
>
> As a member of the National Safety Council, we are privileged to use the Green Cross for Safety to designate not only our interest in safety, but to emphasize and call attention to the safety precautions in this manual.

Although I am not personally familiar with what other farm equipment manufacturers do in this regard, I understand practically all have somewhat similar safety notations or highlights in their operator's manuals.

Farm machinery cannot help being somewhat hazardous in certain places if the machine is to do the work for which it is intended. For example, if a mower is to cut hay, it will also cut off a man's finger if he puts it where the grass should be; and if a cornpicker picks corn, it will also "pick" a man's arm if he puts it where the corn stalk should be. Tractors are hazardous if not properly operated, but so are cars, trucks, etc. Even horses were hazardous "in the good old days" (what was good about them), if the horses were not properly handled—and I never saw a "Horse Instruction Manual," with or without safety notations. For example, runaway and kicking accidents could be (and were) quite serious.

In the second area, of getting farm machinery dealers, wholesalers and manufacturers to help you by assuming safety leadership in their respective communities, there seem to be unlimited possibilities. The more I've thought about it, the more possibilities there seems to be—if we can just "cover all the bases."

It will take a lot of salesmanship—personal salesmanship. You will have to "sell" the idea of these various people assuming leadership. You will have to "sell" them on the importance of the job that has to be done and also on the personal satisfaction of helping save lives or avert serious disabling and painful injuries. You should also "sell" them on the importance of better "time-of-delivery" instructions to purchasers and users—all users. Farm equipment will

be not only safer—it will work better and the dealer will not have to make as many after sale service calls on the customer. Appeal to these individuals' selfish interests and play up the safety angle as a gratifying "dividend."

The National Safety Council's Farm Division is going to help you. In the July–August issue of the *Farm Safety Review*, there is to be an article entitled "Mr. Farmer. . . . Now That You Own This Tractor." It has been prepared by Jack Burke of the Farm Division staff in cooperation with the Farm Equipment Institute and the National Retail Farm and Power Equipment Dealers Association.

After this article has been published, it is to be printed as a 4-page leaflet for distribution by all the cooperating organizations. I hope this is just the beginning of other similar articles on cornpickers, combines, balers, mowers, etc.

In my position as Vice President for Farms of the National Safety Council, I propose to write a letter to all of the larger manufacturers of farm equipment and recommend that they urge their dealers to do an even better job of "time-of-delivery" instructions, especially safety instructions. We will be able to reach about 99 percent of all dealers through the cooperation of the 15 to 20 largest manufacturers in the farm machinery industry.

I will also solicit the cooperation of Douglas Hewitt, Executive Secretary of Farm Equipment Institute, and Charles Frederick, Executive Vice President of National Farm Power Equipment Dealers Association on this important matter.

One word of caution—you won't ever "sell" them all, BUT personal contacts and persistent followup will help.

The third area I want to talk about is the size of the safety problem and the size of the industry all of us serve.

You know, even better than I do (because you are closer to it and live with it every day), the size of the agricultural safety problem—it's a king sized problem. But I wonder if even you professional safety people fully realize how big the industry is that all of us serve. The industry I'm talking about is, of course, agriculture.

We all know that agriculture is our most basic business, but sometimes I wonder if we fully appreciate the size of agriculture compared to other big business.

Just what do we mean when we say "big business?" Well, we can all agree that the automobile business is "big business"—one of the biggest. On the basis of capital invested, let's have a quick look at the motor vehicle and equipment industry. There is an investment in the motor-vehicle industry today—in land, buildings, machine tools, and equipment—of about $16 billion. Let's let this man

right here represent the automobile industry for the purpose of size comparison.

We all know that the iron and steel industry, being a basic industry, is even bigger than the auto industry. How much capital is invested in the iron and steel industry? About $23 billion, or almost half again the amount invested in the auto industry. Here is Mr. Iron and Steel Industry by comparison.

Now let's have a look at a really big basic business in this great country of ours—our biggest and most basic business—agriculture. Do you think it's half again as big as the iron and steel industry? Or, maybe as big as both the iron and steel industry and the auto industry put together? Well, you are wrong, it's 11 times as big as the auto industry and almost 8 times as big as the iron and steel industry. As a matter of fact, it's considerably more than 4 times as big as both of them put together.

This is Mr. Agriculture by comparison—who has a combined investment in his business in land, buildings, and equipment of about $172 billion. Actually, farmers and ranchers have almost as much money invested in just the machine tools of their industry—farm machinery, tractors, and trucks—than the total investment in land, buildings, and equipment in the entire iron and steel industry.

Another yardstick to use in comparing the size of agriculture is employment. Total employment in agriculture in 1963, according to the U.S. Department of Labor's Bureau of Labor Statistics, was 5 million. This compares to only 750,000 (approximately) in the steel industry and just a few less than that in the automobile industry. Less than *half* as many people are employed in the steel, automobile, aircraft, and farm equipment industries, all added together, as in agriculture.

So we are all serving not only the most *basic* business but also, by far, the *biggest* business in this great country of ours.

The Role of Farm Leaders in Safety Programs

PAUL C. JOHNSON, *Editorial Director,* PRAIRIE FARMER, *Chicago, Ill.*

As a farm editor I have been involved in many farm safety campaigns. Our paper has blown hot and cold. We have won awards, and we have just sat on our hands. We have had moments of success, but more often we have regarded our safety work as a dull routine of duty.

To step up our effectiveness we have tried shock treatment, and we have tried schmaltz. We have indulged in sloganeering. All of these

have a common weakness: they peter out, they bog down, or they seem to induce a kind of immunity to safety education.

We have repeatedly urged everybody to get into the safety act, hoping to achieve results by saturation. As a result, safety has become everybody's business, and also nobody's business.

Against this background of experience, we are inclined to long for regulations with teeth and laws with clout. Insurance companies have some power to compel. We are now talking about laws to license the use of chemicals.

It seems quite clear, however, that compulsion will not get very far in agriculture, and especially in the safety field. We will still have to put our reliance on education and the voluntary approach. We will have to cudgel our brains for new and more thorough ways of convincing farm people that carelessness is costly, that farming does not have to remain one of the most dangerous of vocations.

My specific assignment is to explore the role of adult farm leaders, both in their organizational and educational functions. I have acquired some rather definite ideas about the subject which I will set down as briefly as possible. If I move rather quickly from the role of voluntary leaders to the methodology of safety education, it is because the two are inseparable.

Following are my suggestions for a comprehensive farm safety program that would be voluntary in nature and would draw its support from farm-oriented organizations and its guidance from the cooperative extension service:

1. There should be one unified program for a county or its geographical equivalent. Let's stop encouraging every organization to go off on its own, indulging in halfhearted or half-baked propaganda that may immunize the farm family rather than influence it.

2. General farm organizations, farm cooperatives, and other rural groups can contribute money, manpower, and leadership to this central program which should be operated by the Cooperative Extension Service, or a safety council working closely with that Service.

3. This unified agency should come up with a systematic, well-planned program, having a duration of a full year rather than just a week or a month. The goal should be to shoot with a rifle rather than a shotgun, to hinge the program on action rather than just talk.

4. Every family should be reached with some device that puts the responsibility for farm safety on the family where it belongs.

5. There should be some kind of check sheet that gains attention and stimulates action. To do this it must be seasonal, workable, and reasonable in its demands.

6. The feasibility of any program is of first importance. Farming is a demanding occupation that tends to push out other considerations. If we ask for the impossible we get nothing. Exhortations from the armchair are likely to do more harm than good.

There is nothing new about the above suggestions. Scores of good safety councils and committees have cudgeled their brains for years, so it is not likely that I have come up with anything startling or really new. However, let me amplify a few of the above points.

I think it is really important that we use the rifle rather than the shotgun. Furthermore, the unified program needs money to back it. Here is where farm organizations and businesses can do a lot of good. A campaign fund of $1,000 a year should not be out of reach—$5,000 would be a lot better. This can be used for printing, postage, materials and the like.

The check sheet is the best action stimulator that I know of. Our 4–H organizations have used it to good advantage in their safety work. It is my impression that their sheets have been too complicated and that the youngsters have seldom achieved the coverage that is needed.

I wonder how many safety councils have organized a visit to every farm home. I wonder if a well-conceived checklist, printed in red ink on cardboard, with a hole in it to hang on the wall, has ever been delivered four times a year to every farm family. Has anyone produced a calendar with a checklist for each month, positioned in such a way that it would have to be torn off before you could use the calendar page?

Perhaps there could be some kind of reward attached to this checklist that would stimulate mother, who is the custodian of the family's health, or the children who are always looking for something interesting to do.

I do not want to leave this subject without putting in an extra plug for reasonableness. One of the common mistakes of safety crusaders is to insist on the gold-plated Cadillac when you could get farther with a good wheelbarrow.

For instance, many safety people insist that no farm youngster should be permitted to ride on a tractor, much less operate one, until he is 16 years old. Let's face the fact that on the average farm it is inevitable that a sturdy boy of 10 or 12 will be pressed into service in emergencies to drive a tractor. Let's also face the fact that this youth, proud of his achievement and very respectful of the big machine, may be a lot safer driver than his cocky older brother or his absent-minded father.

We should hesitate to deal in absolutes when we lay out our safety programs. Safety is pretty much a matter of attitudes. If we can establish a climate of safety in the family, we have gone a long way to achieving our goal.

Safety talk and safety demonstrations are useful, but they are not really the heart of a good program. It's much too easy to let them go in one ear and out the other.

So my plea today is for a unified safety organization with a specific program representing our rural leadership across the board. The first test of adult leadership is to pinpoint responsibility in some committee or council and to back that council with both manpower and money.

The Role of Farm Youth Leaders

MAYNARD H. COE, *Agricultural Consultant, Thor Center for Better Farm Living*

One of the many fine achievements of present day agriculture is that it is becoming safer than in the past. However, this improved record, continuous as it is, has not yet relieved agriculture of the stigma of having the poorest safety record of most occupations. Nevertheless, with industry proving that accidents can be prevented, agriculture has set about with determined zeal to make a similar record. In this effort it is achieving encouraging progress. The fatalities from farmwork accidents have been reduced almost one-third in the last 5 years. As we anticipate hopefully agriculture's continuing improved safety record, we must remember that its price is eternal vigilance plus effective education. It requires the coordinated effort of various groups in agriculture and those related thereto. It requires leadership of the highest quality.

It must be realized that while farming is a highly complicated business it is also a way of life which involves entire families. It is important therefore that all the members of the farm family, including the young people, be made safety conscious in all fields of activity relating to that family.

While all members of the farm family are equally important in any farm safety program, yet it is the young people to whom safety has a special appeal. The 4–H youth organization was the first to emphasize safety, and from the very beginning rural young people have been in the front rank of safety. They have performed a great service in saving life and limb in rural America. No segment of our rural population is in better position to focus attention on the prevention of

farm accidents than is the rural youth. In spite of that fact, our interest in young people is due, not only because they are youth, but more especially because they are members of farm families.

With this preliminary statement, let us consider the safety opportunities and responsibilities of leaders dealing with young people. These will include (1) our colleges and universities that are training our leaders for the future, (2) parents of our farm boys and girls, and (3) leaders of rural young people's organizations.

Let us consider first our colleges and universities which are conducting courses in agriculture and home economics, and thus have the opportunity and responsibility for incorporating safety education into their curriculums. This is being done to some degree at present, but it should be appraised with a view to improving its coverage and effectiveness. Farm safety should always be accorded a well-planned emphasis in the three basic areas of agricultural college service; namely (1) resident instruction to on-campus students, (2) social and physical research to uncover improved safety techniques, and (3) through its extension service, to carry safety education to the farm family.

The on-campus courses should not only instruct or educate in safety techniques, but also be of the nature to result in inspired and effective safety leadership. In the area of safety research, our agricultural colleges have been sadly deficient. Such research is needed, not only for the general progress of farm safety, but also to attract the interests and cooperation of young people, who are always influenced by new developments. If the extension service is to be truly effective in safety, it must have on its staff in each State at least one full-time farm safety specialist, who will give statewide leadership to farm safety in all its aspects, including the work with farm youth and their leaders. Cannot this conference take positive steps toward the employment of such specialists? In fact, this should be accomplished, not only by our college agricultural extension service, but by the major farm organizations as well. This is a challenge to this conference.

Our next group of leaders is the parents, who occupy the most strategic position of all as farm safety leaders. The farm offers young people a better opportunity to learn the skills of living and working than does any other occupation. The almost endless number and variety of important farm tasks provide an outlet for youthful energies, which, if properly channeled, will develop these young people into useful happy members of society.

Therefore, the children in the farm family should be given the opportunity to assume the responsibilities of work, which will encourage industriousness and self-discipline, but these responsibilities should not involve potentially hazardous situations. It is important

that the jobs assigned young people fit their mental, emotional, and physical capabilities, otherwise accidental death and injury may result. Overwork can ruin health and kill the initiative that assignment of proper responsibility should develop.

Youth like interesting work. They enjoy looking back on a job well done and the recognition that should come from such achievement. Young people working at tasks safely within their capabilities and training are not spending their time at senseless hazardous activities. Patience and understanding parental supervision and training are the keys to useful, happy, and safe growing up. Because young people spend much time helping parents and working along with them, it is especially important that parents set good examples. Safe habits while learning a job will remain part of continued effective job performance.

Young people almost always ask the why or how when a new situation confronts them. Taking time to explain the why or how of safety precautions is one of the most important contributions a parent can make to the future of farm safety. I ask this conference, Is not the time at hand when the parents of safe farm families should be given suitable recognition for their leadership in safety?

In the early days of farm safety education, there was a common, though unfounded, belief that misfortune such as accidents "just happen," or that they "can't happen to me." The credit for the correction of this negative attitude toward accident prevention should be given in large measure to the efforts of youth organizations. The 4–H Clubs, the FFA, and possibly other youth groups have made great achievements through their safety projects. Time after time, place after place, they have proved that most accidents can be eliminated through the systematic planning and efforts made by all individuals of the rural community. Thus it is that probably the most important key to farm safety is our rural youth organizations. The young people in these organizations, together with their leaders, readily accept personal responsibility for accident prevention because they realize that they have a personal stake in safety, not only in avoiding personal harm, but also in safeguarding the well-being of their families, friends, and members of the community. No group is in better position to be influential in the prevention of farm accidents than is the rural youth organization. Herein lies the challenge to youth leaders.

A few specific suggestions by which farm youth organizations, through the influence of their leaders, can and do take part in making agriculture a safer occupation are:

1. Include farm safety activities in the local youth organization program by:

a. Answer roll calls with a statement on what members have done to prevent farm accidents, or how some accident that occurred in the family might have been prevented; or describe what someone has done to eliminate a hazard or to improve conditions for greater safety.

b. Have short talks or panel discussions on farm and farm home safety.

c. Give safety skits or demonstrations.

d. Have each member participate personally in a year-long safety project on his farm or in his home.

2. Another specific suggestion or project is that of setting up an accident reporting plan by which all accidents occurring in the community will be recorded. This should include, not only a reporting of these accidents, but also at community meetings, a discussion on how each accident could have been prevented. Can this conference facilitate, if not set in motion, the plans and facilities for such a youth project?
3. Another suggestion is that of sponsoring a community safety day to which other rural youth groups and adult group organizations are invited to cooperate. Achievements of the past can be recounted at these community safety days, but more importantly, special consideration should be given to existing hazards in the community and ways and means of eliminating them.
4. Still another activity is that of safety exhibits and window displays relating to important hazards in the community, for use at fairs, community meetings, and in store windows. Adult organizations might offer special prizes or recognition to be awarded to the best displays.

Awards and recognition play an important function in all youth safety activities. One of the great results of these awards comes from setting valued standards of achievement. These standards must be fully protected. Judicious award programs based on accurate records and intelligent rules that are honestly followed are extremely valuable and, in fact, essential. There is need for more adequate standards governing awards. Whoever can suggest such standards, whether it be this conference or others, will make a great contribution to safety in agriculture.

In general, safety awards to rural young people may well continue to be made in two general categories: first for individuals, and second for organizations. Some of these awards may be competitive, but perhaps the most valuable awards are those that are noncompetitive in nature. They are conferred upon those individuals and organizations achieving a certain level of accomplishment, either specified in

the rules or established by a board of judges. The details of achievement are not required to be uniform from individual to individual, or from organization to organization. Under such circumstances, the competition existing will be between those who receive awards and those who do not.

And now I'm going to be foolhardy to suggest something new, or at least a bit different. While much has been accomplished by means of the incentives that have been provided in safety projects for rural young people, yet the full potential has not yet been realized. The field is still wide open for startling new projects with wise and adequate incentives. The projects in the past have been far too few and on too modest a scale. Some day some forward-looking individual or organization will offer a startling new nationwide award program in farm safety for rural young people. It may well be kicked off by a nationwide radio and television hookup, and the opportunities it will provide will be so challenging that increasing numbers of rural young people will seek to participate. Such a project will hit the headlines of the Nation's news media; it will furnish the basis for interesting stories on safety in all our farm publications; it will attract the cooperation of rural adult groups and even the attention of urban organizations throughout the country. It may well center around practical farm safety demonstrations which will encourage participation by individuals, by small groups, or by large organizations. Over the years it may well include a wide range of farm safety activities, and the awards and incentives should be provided for both organizations and for individuals. It should be related to all types of farming from the northeast corner of the country to the southwest, and from the northwest to the southeast. From the outstanding participants in each community, county winners would be selected and brought together into regional State meets, where selection would be made of those who would later come together in the statewide meet. Those selected in the statewide meets would finally come together in a great national young people's farm safety exposition. And here again, the event might well be covered by nationwide hookup of radio and TV.

This may sound visionary to some, or it may seem too ambitious or too large or too something else to be undertaken. To all of those I would say that young people are challenged by great endeavors. They like to participate in great events. Furthermore, no effort is too large or too costly to be undertaken in behalf of effective farm safety. Our progress in the past has been modest because our efforts have been modest. They have been far too little in relation to the magnitude of the problem. The time is at hand to step out and make large scale efforts and no group is more worthy of such consideration than our farm youth.

Yes, progress has been made. As I go about the country visiting with the men and boys who are operating powerful and complicated machines, I am impressed by a new sense of safety indicated by these men. Thanks to the press, radio, television, and other channels of information, the hazards of farming are better understood today. But there will be many tragic accidents in this crop year.

We must always remember that each year there will be many less experienced workers in the fields. Most of these are young people and to them we owe a great responsibility. Just because a youth can start a tractor and steer it down the field is no assurance that he fully understands how to avoid dangerous situations. The tractor is a powerful tool, but it has never been known to run a man down of its own free will.

Also, each year there are small children who are getting their first experiences about the farm. One of their great aspirations is to ride in from the field with Daddy, and how often am I shocked to see a man with perhaps two or more children hanging onto the tractor, maybe around the seat, while he bounces in from the fields. Yes, it's a joy ride provided one of them doesn't fall off and get run over by a machine that's being trailed behind the tractor, or worse yet, run over by one of the powerful tractor wheels.

After more than 20 years working with farm safety, one can get just a little bit discouraged, just a little bit frustrated that accidents continue, and we must remember that there is always new material coming along on which accidents feed. The work of educating for farm safety must start with youth, but its speed of accomplishment will not be accelerated by the modest efforts of the past. Real progress in farm safety awaits the vision and courage to go after great objectives. Rural young people are awaiting such a program.

This brief presentation has done little more than to suggest some of the opportunities and responsibilities of the leaders of rural young people. Such leadership includes our colleges of agriculture, and in that connection emphasis was given to the role of the farm safety specialist and the need for such specialists in every State.

An effort has been made also to emphasize the strategic role that parents play as leaders of youth for safety and the need for greater recognition of them as such.

And finally, we have given great emphasis to the importance of forward-looking leadership in our rural youth organizations, and the need for challenging and perhaps startling projects and activities. The existing youth projects are fine and should be continued, but is it not time to provide and encourage programs of greater depth and significance, which can result in accelerated progress?

The Role of Farm Women Leaders

MRS. ALMER ARMSTRONG, *Information Specialist, Indiana Statewide Rural Electric Cooperative, Indianapolis, Ind.*

Keeping in mind the conference theme, "Mobilizing Leadership for a Safety Breakthrough," and the one for this particular session, "Leadership, Its Achievements and Opportunities," may we delve into the "Role of Farm Women Leaders," looking upon this subject as one of opportunities.

If an individual is a leader in her organization, as a rule, she is a leader in her community and definitely a good manager and stimulator in her own home. It is from this home base that we wish to start. This women will practice what we'd like to call the four "R's". She will be *Ready*, *Resourceful*, *Right*, and *Responsible.*

To be ready, this leader will check her home and the habits of each member of her family, and set about to eliminate all possible hazards, and correct or make as safe as possible any that cannot be removed.

She will be the first to make changes inside the home or around the farm. She will be ready to devise ways and means of influencing her family to be safety conscious at work and at play, and to drive safely at all times.

As a leader, she puts these safety measures into practice in her home. She will be equally as anxious and concerned about expanding the same ideas in her organization. She will be the first to be ready to encourage a program in any special field of safety.

For example, if a poison prevention program is to be promoted in her State or county, she could be very resourceful and could well be the leader who would present the questions about poison control. She would be able to show the need for further information about the situation on the local, State, and national front.

This leader would also know something about other groups having data, and would locate information about existing programs and resources for local programs.

The farm woman taking the role of leadership will be ready to go beyond the regular call of duty. She will step out in front with ideas. She will be resourceful enough to have the facts, and she will most certainly be *right.* She will give out only correct information, for accurate and definite information is a real asset in developing a program.

This leader will be responsible for followup, assisting in a quiz or survey to learn more about the need of a particular safety program.

Farm women leaders will be responsible for learning: (1) what the real problem is; (2) which key groups in the community could

carry the ball; (3) what is presently being done (in poison control, there is need to coordinate educational activities with control centers, regulatory agencies, and others); (4) who should be reached; (5) what type of activity could be promoted; and (6) whether there is a need for local codes or regulations.

Although we have used the poison control program as an example, these basic steps would apply in any phase of safety. Farm women leaders have a wonderful opportunity to contribute to the achievements of their respective organizations, but most of all is the opportunity to protect their own family and do something worthwhile for their community.

The opportunity for farm women to explore the relationship of farm accidents and health is a wide open field. If a farmer or a member of a farm family is injured, the cause of the accident could well be a health factor. Women leaders should sponsor a program of "periodic physical examinations."

In any industrial plant these examinations are required, but on the farm they are not. This is too bad, for on the farm it is impossible to alter duties—farmwork continues. Farmers need to know their health status.

Farmers don't take coffee breaks, but women's organizations could and should encourage their members to provide milk, lemonade, coffee, or fruit juice breaks for the men in the field. These breaks may be as, or even more, important for the farmer than for the man in the plant.

As people, we like to be a part of a program or an activity. No greater opportunity is available than for farm women to take the lead in setting up an alert system. In any county or community, women could sponsor a "Help Your Neighbor" program. Step one would be to coax or encourage them (or by any other means necessary) to place a red flag on the machinery the farmer is using so it can be seen moving back and forth across the field. If this flag stays in one place too long, take time to check to be sure, rather than sorry, that he isn't ill or hasn't had an accident. If you must be away for a day during a very busy season, ask a neighbor to keep watch. You can help your neighbor in return when she is away.

If all the women in the neighborhood were to do this, your husband would not feel that you were making an oddity of him by protecting him to this extent.

Women can be leaders in any safety program they choose, whether it be farm, home, recreation, or traffic.

Women who are Ready, Resourceful, Right, and Responsible can "move" mountains. The following are some suggestions which could

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be a key for an activity in any community: (1) Study the need for the program most needed. (2) If it is a program requiring legislation, be sure to seek information on existing laws or regulations. (3) Keep members informed. Be sure members have a complete knowledge and understanding of same. (4) In the case of traffic safety, form local citizen support groups. (5) Encourage and help organize safety clinics or workshops.

Who is responsible for starting a community safety effort or program? One person, one group, or a number of individuals or organizations.

A farm woman who *believes*, has an idea and convinces others of the importance of doing something, will be fulfilling the role of leadership, and will accept the challenge of taking advantage of an opportunity to act now. Don't delay—tomorrow may be too late.

The opportunity of letting your family know that you love them, and letting the people in your community know that you "care," will be the most satisfying reward any leader could hope to attain.

* * *

Recommendations of the agricultural workshop are based upon discussions in four areas: Leadership Opportunities for Industry (chairman, Vernon S. Peterson, E. I. du Pont de Nemours & Co.); Farm Organizations (chairman, J. K. Stern, American Institute of Cooperation); Youth Organizations (chairman, Claude de St. Paer, American Farm Bureau Federation); and Women's Organizations (chairman, Mrs. Eugene L. Survant, National Extension Homemaker's Council). See p. 37 for Report of Workshop: Agricultural Leadership, Its Achievements and Opportunities.

WORKSHOP: SAFETY THROUGH DESIGN

Moderator: JAMES F. VAN NAMEE, *Administrator, Accident Prevention, Westinghouse Electric Corp., Pittsburgh, Pa.*

Introduction

MR. VAN NAMEE

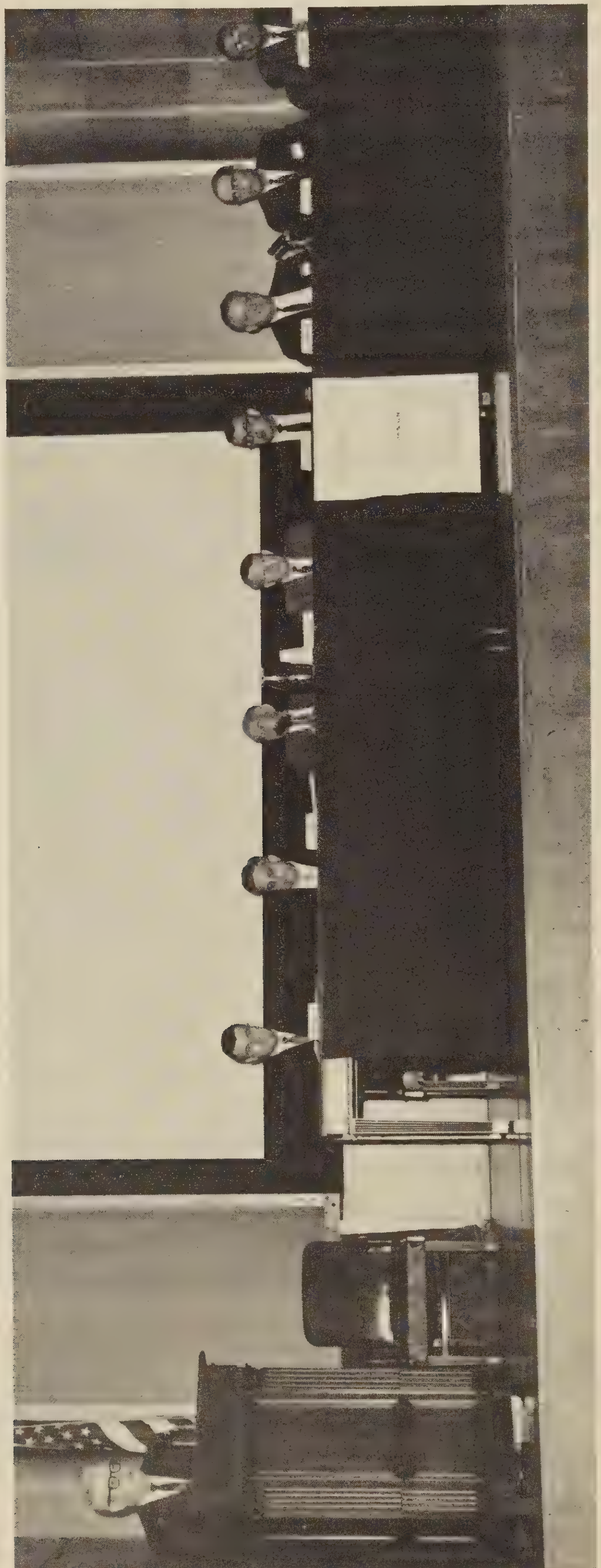
The elimination or minimizing of hazards from a job operation and the area where work will be performed can be accomplished most effectively and economically at the time the equipment is to be purchased or modified, or during the period of planning for any new or altered facility, process, or operation.

For many years progressive companies have routinely had their fire insurance carriers review proposed plans for such features as the layout of automatic spinklers, underground mains, and water supplies; new building construction; flammable-liquid storage, distribution piping, and processes; industrial heating equipment; and other hazardous operations. Such a procedure has assured the companies that all necessary features for safety from fire or explosion are incorporated at the best time—in the planning stage, before the work is actually started.

The outstanding fire safety record enjoyed by most industries in the United States is the result of such advance planning. Why then should we not pursue the same policy of advance hazard analysis in an effort to further affect control over occupational accidents?

The purpose of providing safety through design would be to reveal any anticipated unsafe physical, mechanical, or environmental conditions that may be associated with the facility, the process or operating equipment so that practical steps can be taken to eliminate the unsafe conditions or operating procedures that could be the cause of accidents.

During the planning stage for the construction of new facilities or changes in existing ones, and the development of new or revised processes, safety review of plans or process specifications is essential to assure that safety of personnel and the public is given adequate consideration.



James F. Van Namee (at lectern), Westinghouse Electric Corporation, led discussion: "Safety Through Design." Seated (l. to r.), Thomas H. McBrien, Westinghouse Electric Corporation; Jack S. Snyder, Merck and Company, Inc.; Willard A. Dudley, Eastman Kodak Company; Vaughn Hill, E. I. du Pont de Nemours & Company; F. X. Worden, Western Electric Company, Inc.; P. S. Ridley, Westinghouse Electric Corporation; and Norman Dunlap, Minster Machine Company.

There is also a need to take practical and positive steps to protect personnel from the inherent hazards associated with the operation of mechanical and process equipment. While machine-tool operations do not produce the greatest number of employee injuries, the injuries associated with machine-tool operations are usually of a serious and costly nature. Ideally, machines should be designed so that there is little or no operator exposure to injury. Machine guards, when properly constructed and maintained, provide operator protection and, in most cases, will not adversely affect the output of a machine. It is recognized that certain machine operations cannot be effectively guarded because of the inherent nature or the function of the machine itself. This does not infer that nothing can be done, since there are other approaches which should be explored to eliminate or reduce the exposure. This may be accomplished by designing remote or automatic feeds which will keep an operator's hands or arms away from the point of operation or other unguarded moving parts of the machine which are exposed to an employee. Other design approaches to minimizing machine hazards include the determination of whether the material can be formed or blanked by using other methods or machines, or whether the material itself can be obtained in any other size, shape, or form that might reduce or eliminate hazards that stem from hand-feeding operations.

Loss of hearing from working in an excessively noisy industrial environment is defined as an occupational disease by the laws or regulations of many States. Because occupational loss of hearing may not be immediately recognizable as an injury, since it usually develops as a result of prolonged exposure, it is essential that the methods for controlling noise are also included whenever a new facility is planned, an existing one is revised, and production or process equipment is built or purchased.

To accomplish safety through design, the elements necessary for optimum hazard control contemplates:

Providing for practical safety considerations in both the design and layout of facilities, and the design and placement of equipment within structures.

Preplanning for the safeguarding of physical and mechanical hazards which present an accident or injury exposure that could adversely affect employees or the public.

Providing for environmental controls and noise abatement during the planning stage.

In order to offer some of the more important guidelines on how to mobilize leadership for a safety breakthrough in design, the following subjects will be discussed today: Safety Design Considerations for

Layout Facilities, Placement of Equipment, and Production Processes; Safety Design Considerations for New or Revised Chemical Processes and Process Equipment; Safety Design Considerations for Production Equipment; Safety Design Considerations for Noise Abatement in Facilities and Equipment.

Safety Design Considerations for Layout of Facilities, Placement of Equipment, and Production Processes

THOMAS H. MCBRIEN, *Supervisor of Safety, Westinghouse Electric Corp., Baltimore, Md.*

Today's safety coordinator is continually trying to improve the safety program in his operations through the elimination of unsafe conditions. In working towards this end, he often has standing safety inspection committees which make routine checks of the various departments and areas in an effort to uncover hazardous conditions so that steps might be taken to correct them. His ultimate goal, or objective, is to attain operations which are completely hazard-free.

If he is ever to come close to reaching this very worthy goal, he must make sure that new hazards do not creep into his operations as facilities and equipment are added to his complex. It is, therefore, necessary that he take steps which will ensure that safety is designed into all new or revised facility layouts, placement of equipment, and production processes prior to their installation. In so doing, the safety coordinator will not only help to prevent new hazards from arising but he will also be able to save his company considerable expense by not having to make costly changes to equipment and facilities after installation—if they can be made at all. Further, by having preplanned safety into the new installation there are no costly delays to production schedules upon completion of the new facility.

Establish a Policy and Procedure

In establishing effective control for the inclusion of safety design considerations for all new or revised installations, it is imperative that company policy first be established which will declare and spell out management's intentions in this area. Too often, safety personnel embark upon ambitious safety programs without first confirming them with top management to ensure that they hold the same convictions and will support the program. Having a written policy included in the company's safety manual, or other authoritative document, will assist the safety coordinator immeasurably to successfully carry out his program.

Once a policy has been established, the next step is to develop a procedure which will explain in detail how the policy is to be carried out. Again, this procedure should be written down, preferably in the company's safety manual, and distributed to all management personnel.

Implementation of the Program

In carrying out his program of safety review of all new or revised facilities, the safety coordinator should work through the following groups within his immediate organization:

Engineering Department.—In most large companies each department or plant area has an industrial engineer or manufacturing engineer assigned to it whose job it is to see that the operations are performed in the most efficient manner possible. Also, it is usually the industrial engineer or manufacturing engineer who initiates the request for a change, or an addition to the existing facility. In smaller companies the departmental foreman, or some other engineering personnel, may have this responsibility.

When an unusually large facility change is to be made, such as an addition onto the existing plant, the facilities engineering department would handle this in a large company, while an outside consulting firm would probably coordinate the activity for a smaller company.

It is at this point—the planning stages—that the safety coordinator should come into the picture and follow the project through, step by step. The group which is initiating the project is responsible for seeing that the safety coordinator is properly notified.

Director of Budgets.—After the necessary approval has been obtained to go ahead with the new installation and bids on the work received, the next step would be a request for monies from the director of budgets. This person, whoever he may be, is an excellent checkpoint for the safety coordinator to establish in his program because he has to give his approval for all requests and, therefore, can verify to see that the safety department has been properly consulted.

Purchasing Department.—After bids have been received and monies approved for the new facility a purchase order is released to the supplier(s). It is very important that the safety coordinator inform those who are placing the purchase order to specify, in the purchase order, the exact safety requirements that are to be incorporated in the equipment being purchased (example: noise levels, explosion proof ratings, exhaust velocities, etc.) or in the case of outside contractors, the safety program that they must follow while working on the company's premises.

I can remember a few years back when one of our plants was planning to purchase a water wash-type paint spray booth. In discussing the features of the booth with the sales representative, we indicated that the booth had to produce 150 linear feet per minute of air movement across its face opening. He said that there would be no problem in meeting this requirement and proceeded to order us their standard booth. However, when our purchasing department spelled out our requirements in the purchase order, we received a call in a few days from the manufacturer's engineering department telling us that a second fan would have to be installed in the booth in order to give us our required air velocity.

Maintenance vs. Outside Contractors

In most cases, particularly with the smaller installations, the plant maintenance department will be performing the necessary work of rearranging benches, putting up shelving, and lagging down machinery. With these installations the safety coordinator should work closely with the various maintenance foremen and responsible engineers following the project to make sure that not only the installation is made according to the approved prints, but also that all construction work is done in a safe manner. Concern should be given to such things as hazards from welding operations, overhead work, use of rigging equipment, safety of other plant personnel working close by, etc.

In larger installations where the facilities engineering department or outside consulting firm is involved, such as with plant additions, remodeling an entire section of a plant, constructing outside buildings or towers, etc., it is very important that the safety coordinator work closely with the individual who is the company's liaison person between the plant and outside contractors. With these larger installations, the safety coordinator must be chiefly concerned with (1) the safety of company employees working in or close to the area where the installation is to be made; (2) the safety of the contractor's employees when they are working in or around hazardous company operations; and (3) the company's buildings and properties that could be damaged or destroyed by the work performed by the outside contractor. In most cases, the safety coordinator would not be directly concerned with the safety of the contractor's employees—only where they may be injured by operations performed by company employees. The reason being that possible legal action could be brought against the company when outside contractors' employees are injured while performing work in accordance with instructions from a company official.

Safety Requirements for Outside Contractors.—It is strongly recommended that the safety coordinator have planned safety requirements for contractors working on company property. Further, these requirements should be incorporated in the original bidding instructions and attached to the contract of the successful bidder.

I will not attempt to list all of the safety requirements that should be included for outside contractors, but I would like to point out that consideration should be given to such major items as: a required inspection of the site by all contractors prior to bidding; compliance with all safety codes and regulations in the work that is to be performed; a required meeting be held with the safety coordinator and the successful contractor prior to commencement of work; availability of the contractor's prints and work schedules be made to the safety coordinator; a statement giving the company the authority to stop work which does not meet the safety standards agreed upon; periodic inspection programs by the contractor as well as the company and a procedure for reporting accidents which produce injuries or damage to company properties.

This last safety requirement is very important particularly as it applies to damage of company properties. Our most recent lost-time accident, which occurred less than a month ago, was caused through damage done to some of our equipment by an outside contractor.

We are in the process of air conditioning the manufacturing sections of the aerospace division. This work which involves extensive installations of overhead ducts is being conducted by outside contractors. The work, of course, is done on off hours when none of our employees are working below.

One night while installing some of the duct work, a section fell against a light fixture support over one of our assembly benches which broke the base of the support off at one end. The damage was not reported or repaired by the outside contractor. The following day, which happened to be Saturday, a woman employee, while operating a small drill press at the bench, had the misfortune of having the support with its two fluorescent light fixtures attached to it come down and hit her on the back of the head and neck, causing her to be hospitalized.

Through the investigation of this accident, we found similar "booby traps" elsewhere in the plant which were created by the outside contractor. Needless to say, a special meeting was held with officials of the prime contractor to correct these conditions and to see that steps were taken to prevent others from occurring in the future.

Outside Assistance.—There will be times when the safety coordinator will have to go outside his immediate organization to obtain

advice and assistance for making decisions concerning a proposed new facility. I am referring to such groups as overall company administrators in the field of safety, health, law, engineering, etc., insurance representatives, local, State, and Federal safety and health people. To give an example, I can remember about 3 years ago when it was necessary for one of our plants to receive an authorization from the State Department of Health before it could begin planning a nerve gas facility. The Army Chemical Center stated that the work was not to be done in localities which had health regulations prohibiting such installations.

Aids for Safety Coordinator

To assist the safety coordinator with his safety program for designing safety into new or revised facilities, he should have:

1. *Checklists.*—Will call to his attention the various phases of a new installation that should be given safety consideration. Included in these checklists should be such items as: equipment and installations which must meet local, State, and Federal codes; vehicle traffic routes; location of exits; fire safety procedures; rigging safety requirements; barricade requirements; overhead hazards; unusual plant hazards that might be in the construction area (such as radiation, high voltage, toxic gas, etc.).

2. *Signing Off of Prints.*—A procedure should bet set up which requires all layout prints to have the signature of the safety coordinator. A block should be established on prints which is designated for the safety coordinator's signature.

3. *Equipment Tag Out System.*—Requires all new altered equipment to have a special tag placed on it and the need for the safety coordinator's review and signature before it can be removed and the equipment placed into service. When signed off, the tag should be filed with other pertinent information on the new equipment.

4. *Project Status Report.*—A report should be published regularly by the engineering department listing all of the new or revised installations that are under consideration and their current status. The report should contain the following information:

   a. Projects working.
   b. Projects submitted for budget approval.
   c. Projects submitted for bids.
   d. Projects in plans and specification stage.
   e. Projects—preplanning and estimating complete.
   f. Projects submitted—not scheduled.

5. *A list of Safety Requirements for Outside Contractors Working on Company Property.*—Was previously mentioned.

Some Problem Areas

Theoretically, if these procedures are established and implemented, there should not be any problem with getting safety designed into new facilities. However, through experience there are certain weaknesses which can develop and the safety coordinator must constantly audit the program to guard against them.

Some of these weaknesses are:

1. *Department Supervisor.*—On smaller jobs especially, he will often try to shortcut the system to get a job done as cheaply as possible by contacting the maintenance department directly. In some cases, because he is pressed to meet production schedules, he will try to start operating equipment prior to the completion of the final installation.

2. *Engineering Department.*—Often the safety coordinator is not informed or consulted by the engineering department about the project until after monies are approved. In too many cases, he is not informed until the installation has been made.

3. *Print Changes.*—There are times when changes are made in drawings at the last minute without the safety coordinator's knowledge. The safety coordinator should make sure that he receives copies immediately of all prints signed off by him.

4. *Outside Contractor.*—The contractor will often want to take shortcuts or work overhead while company employees are in the area in order to save time and expense. It is very important to have a previous agreement with the outside contractor that hazardous work will be done during off hours.

5. *Purchasing Department.*—The purchasing agent will often fail to call out the specifications in the original purchase order, so substandard equipment and installations are the result.

6. *Substandard Installation.*—Installations which do not meet safety standards will usually be put in when the safety coordinator has failed to do a good selling job to management. Local, State, and Federal codes should be quoted by him, whenever applicable. Also, he should make reference to the recommendations of authorities when conflicts arise. By noting compliance in other similar installations, both inside and outside, the company often helps the safety coordinator sell his ideas and recommendations to management.

* * *

In conclusion, I would like to say that like most safety endeavors undertaken today, the problem of designing safety into new or revised facilities is a complex one. There are many problems and facets of the program which must be given consideration if one is to be success-

ful with his program. The scientific advancements made in recent years throughout industry do not make the task any easier in carrying out this or any other safety program. If the safety coordinator is going to succeed, he must gain the cooperation and teamwork of others—both inside and outside his organization.

Safety Design Considerations for New or Revised Chemical Processes and Process Equipment

Jack S. Snyder, *Safety Manager, Merck and Co., Inc., Rahway, N.J.*

The accepted accident statistics are favorably impressive for the chemical industry. The National Safety Council's latest compilation shows the chemical industry ranking sixth among 42 in accident frequency. In 1963 more than 100 member companies of the Manufacturing Chemists' Association reported an average frequency rate of 2.98 disabling injuries for each million man-hours worked. These are wonderful achievements, but they don't reveal the complete story. The chemical industry has suffered extensive losses in recent years in property damage and business interruption due to fires and explosions. Some of these explosions resulted in multiple deaths. Damage and loss of business in just two 1962 explosions totaled over $8 million each. Additional facts and figures can be quoted, but they will merely serve to confirm this alarming situation.

I believe we all recognize that the chemical industry has a unique set of safety problems. What other industry uses as many toxic materials in its day-to-day operations, as many flammable solvents, as many reactive and potentially explosive materials? In this industry, the risk has to be calculated not only on the successful marketing of a product but also on its successful manufacturing without injuries, fires, or explosions.

Proper design must be predicated on acceptance of our vulnerability, and our safety considerations must be as unique as our problems.

Management's decision to install a new process is a signal, in many companies, for a flurry of activity from the safety department. If this occurs only when the safety department first begins its safety review of a new process, it is much too late. The decision is made to go ahead, management wants a new process installed as smoothly and rapidly as possible. If the design engineers don't have all the facts concerning the process hazards by this time, the proper safety may never get built in.

"All the facts" is a phrase worth exploring. It is well established in the chemical industry that the design engineer must be made aware

of toxicity and flammability conditions. A wealth of published data is available on the toxicity of existing compounds and classes of compounds, and the same holds true for flammability. Through recognized agencies such as the American Industrial Hygiene Association, National Safety Council, Manufacturing Chemists' Association, National Fire Protection Association, Factory Mutuals, Underwriters Laboratories, etc., assistance can be obtained in determining the toxicity or flammability of new materials. By contrast, however, there are no comparable sources of information or help for determining stability of materials and reactions, and I suspect, in many cases, the analysis of reaction stabilities is not very thorough. Therefore, if we want to prevent the type of uncontrollable rapid reaction that has caused several disastrous explosions, we had better be sure we've done our best to define the parameters of safety operation for conditions such as thermal stability, impact or shock sensitivity, and which incompatible common contaminants can cause an unstable condition to develop.

Safety design considerations, therefore, must begin at the chemist's bench. No chemist should be permitted to present a promising new process for further development with difficult—or even worse—unconsidered, problems in process stability. When a chemist reports out a new process, it should be his fixed responsibility to include a discussion on the stability of the compounds and reaction mixtures involved. Stability data should include a search of the literature and a deliberate attempt to determine the parameters of safety for reactants or reaction mixtures that have recognized potentials for becoming uncontrollable.

Experienced chemists are very knowledgeable when it comes to recognizing the types of compounds and reactions that can cause trouble. The difficulty is that they normally don't think of this reactivity in terms of production size equipment where large volumes of gases produced by sudden, rapid, reactions just can't be relieved. They have to be motivated and oriented to think in this direction.

When the responsibility has been fixed and the chemist has become adept in the art of recognizing potentially unstable situations, he should become aware that there are tests available that will help to confirm or allay his suspicions concerning all three major areas—thermal instability, impact sensitivity, and shock sensitivity.

The bibliography at the end of this paper can be helpful in the recognition of potentially unstable materials and methods for testing. There isn't enough time nor is it appropriate here to go into deeper discussion. Let it suffice to say that there are certain types of reactions, such as nitrations, polymerizations, oxidations, reductions, etc.,

and certain classes of reactive chemicals that require careful stability studies. If these studies reveal potential instability, the degree of risk must be determined and the design engineer told how much of this risk is to be assumed and how much is to be protected against. Many times, of course, the chemists can revise the procedures to eliminate or reduce the risk. This is one of the positive results of stability analysis.

Continuing the sequence of necessary prerequisites to safe design, we should assume that the safety aspects of the chemistry involved is now available. Simultaneously, toxicity studies on new chemicals and intermediates should have been determined as well as flammability and dust explosion potentials. Of course these findings should be documented, preferably in the same text as the process report. The next important step is to pilot this new process in semi-works equipment.

The pilot plant engineer is a key man in the safety picture. The hazards of extrapolating test tube size reactions directly into large scale metal equipment should be obvious to everyone here. The pilot plant engineer is the man who can and does smooth out the material flow and yield problems, who can tell you what the effect of addition rates, corrosion, agitation, temperature, pressure, etc., have on the quality and quantity of each intermediate and the end product being sought. If management assigns the responsibility to him, he is the ideal man to determine if the chemist's process is as safe as was described, and if the reaction rates found to be easily controllable in the test tube are in fact easily controllable in larger equipment. If he is paying attention, he can tell if there are some toxicity or stability problems which were overlooked, if delayed reactions are possible, if there are difficult handling and transfer situations. Many times the pilot plant people find that a certain step is too difficult to run either for yield or safety reasons and the chemist will have to make some changes. They may request additional toxicity, stability, or flammability tests before proceeding. There are a myriad of problems that arise while the process is being developed for large scale operations. If the pilot plant people have the responsibility to look for, understand, and minimize safety problems as well as quality and yield problems, there is an excellent chance that the process will have received the proper safety considerations.

Since the pilot plant people normally are the last ones to work on a process before it goes to the design engineer, you will want to provide a few positive requirements to be sure the process safety information is complete.

Certainly the safety department should be aware that a promising new process is being actively pursued in the pilot plant. One effective way is to have monthly meetings with the pilot plant director to discuss the new procedures being developed. Thus the safety engineer can begin assessing the nature of the new process long before the design engineer is involved.

Another vitally important requirement is the documentation of the safety information in a routine manner. The M.C.A., in their Safety Guide No. 14, calls it a "job safety analysis." I recommend you get a copy and study it. We at Merck require a "safety evaluation." Whatever its name, the purpose is the same. The safety evaluation is required whenever a new process or process revision is reported out by the research laboratories division to the manufacturing division. This evaluation is prepared by safety specialists (not the pilot plant engineers) to assist the manufacturing line organization by evaluating the hazards. The evaluation must include the known or suspected properties of new or unusual raw materials and all reaction mixtures, intermediates, waste streams and products, based on: (1) a literature search conducted by the senior chemist involved in the initial developments in the laboratory; (2) stability tests; (3) toxicological tests—actual animal studies if necessary; (4) flash points; explosive limits; (5) dust explosion tests; (6) unexpected hazards uncovered during research and development.

This evaluation is in addition to the pilot plant report which in itself will contain equipment safeguards and independently describes process hazards and how they are minimized.

One important last item on process safety. Until the manufacturing division is satisfied that all pertinent safety problems have been solved satisfactorily, it will not accept any process from the laboratories.

It isn't necessary to devote any additional time to revised processes. When there are significant changes in a process, similar evaluating procedures must be in effect. I don't want to deemphasize process revisions, because in any progressive company there are bound to be many, but the problems are not too different from the standpoint of evaluating the safety of these revisions. As long as there is a standardized procedure for initiating process changes, and a competent technical group or committee to pass on the feasibility of the process change, a practical approach for evaluating the safety of the process change can be developed.

Now let us progress to the actual design phase. The design engineer has two important safety responsibilities. He must design to prevent toxic exposures, fires and explosions. After this is accomplished,

he must make an about face and additionally design to minimize the results of toxic exposures, fires and explosions. What he does and how he does it must be based on clearly stated company policies, defined as much as is practical in written company standards or guides. There shouldn't be much question in the design engineer's mind, for example, whether a storage tank can be erected anywhere or has to be sprinklered, diked, fireproofed, or buried, or how to do any of these things. The basic rules should be in standards, based on contents, size, proximity to important installations, and similar considerations. There should not be any conflicts on basic safety design criteria between the design engineers and safety people. They should be developed and presented in writing and approved by management. Obviously, we can't encompass all the design engineering required in a set of standards. Every new process contains some new conditions and some new equipment or instrumentation. There are varying mandatory local and State rules and regulations that must be followed. The insurance companies must be satisfied. Nevertheless, it is important to provide basic guide rules to cover as many conditions as possible.

For example, a hazardous indoor process involving toxic and flammable materials requires standards on the quantity, type, and design of building ventilation. The engineer should know whether the electrical equipment is to be installed as class I division 1 or class I division 2. If electrically operated instrumentation is involved, he should know under what conditions he can specify them as ordinary equipment or as intrinsically safe, explosion proof, or air purged. There should be standards on basic vessel design, relief valve requirements, vent sizes, piping, building design, explosion venting, etc.

If the design engineer does not have to wrestle with the basic problems, he can devote his efforts to the specifics of the case at hand. If toxicity is a major problem, he must study in detail where the likely points of exposure can occur and how to minimize trapping personnel. Can he dissipate the contaminant by venting into tall stacks? What is the effect of prevailing winds on the plant installations, and on the surrounding neighborhood? Under what weather conditions can a spill create an emergency?

If large volumes of flammable solvents are involved, he must picture the specified equipment, its location, and the connecting pipelines as well as design from a fire prevention standpoint. Can buckling steel supports add fuel to a small existing fire? Are storage tanks too close to operating equipment? Will the loss of solvent recovery facilities shut down the entire plant? Is drainage designed to move spilled solvents away from important equipment? If a piece of equipment is specially designed and difficult to replace, is it well guarded

against loss by fire? It would be worthwhile for the design engineer to inspect the checklist contained in the M.C.A. Safety Guide No. 17, titled "Fire Protection in the Chemical Industry," as well as the standard N.F.P.A. Fire Codes and the various insurance company pamphlets and books.

When considering stability, he must carefully calculate the efficiency of his reactor cooling system, if a reaction can become difficult to control at 100° C. and the process normally is run at 50° C. He may have to consider providing high temperature alarms; installing emergency venting or emergency quenching, perhaps even isolation or remote operations. It might be best to design tubular reactors with short contact time for reactants and small quantities in the reactor.

Strong reliance on instrumentation is an accepted philosophy in today's design. The fail-safe principle can and should be adhered to for all controllers. Devices which act as checks on these controllers, such as audible and visual alarms, should not be on the same electrical circuits as the instruments they are auditing. For critical instruments, a secondary controller may be a necessity and this, too, should be installed independently of the primary controls.

This list of do's and don'ts can be compiled to a very impressive total but, at best, I could cover only a small percentage of what is contained in the accepted references. Every company must create its own list to fit its specific needs and, most important, it must create the climate that motivates consideration of these safety criteria.

Throughout the design period, the engineer should be required to consult with the specialists in the company for advice and approval—people like the pilot plant engineers, and the safety engineers, the responsible chemists, the assigned operating head.

In our company, the safety engineer presents to management a written evaluation of the completed designs containing a critical analysis of how well the design engineers have safeguarded the hazardous phases to prevent injuries, fires or explosions, and how well the designs will minimize injuries or destruction should the unfortunate occur. The industrial hygienists also are required to incorporate a health evaluation into this safety evaluation.

We don't stop there either. This whole concept of checks and balances must be continued to the finish. Throughout the installation, local operating and safety personnel are responsible for periodically checking conformance to design. Any changes or deviations must be evaluated and approved by these two groups. Communications are critical at this stage between the local personnel and the headquarters groups who worked on and approved the initial stages. In our company, the local safety engineer is required to prepare a written evaluation of the completed installation, including his acceptance of the pre-

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cautions agreed upon during break-in. There must be assurance that all safety devices, including instrumentation, have been tested and will perform satisfactorily. Training for personnel must be planned and well under way. Preventive maintenance and inspection schedules should be in preparation or completed. Emergency procedures must be completed and the emergency personnel, such as firemen, doctors and nurses, rescue squads, etc., properly briefed.

Finally, when the installation is turned over to the operating personnel, this set of evaluations should be combined into one final report and should provide for management a complete picture of the process and equipment hazards, the design criteria employed for the personnel and the emergency organization.

Let me summarize what I've covered in this brief period. To design a safe plant you must:

1. Have the chemists and pilot plant engineers look for and describe all the process and processing hazards involved.
2. Provide as many standards and guides as possible to describe for the design engineer the company's policy on the extent of risk to be assumed. This is not meant in a derogatory or negative sense. Everything we do entails a degree of risk, and judgment is woven into every decision involving the extent of the safeguards to provide. However, this is management's prerogative and wherever practical, their concepts should be made clear.
3. By the proper delegation of authority and fixing of responsibilities, management should provide a system of checks and balances that minimize overlooking any important safety facet and any personnel employed as specialists who can contribute to a safe and efficiently designed installation.

SOME REFERENCES ON STABILITY OF MATERIALS

1. Steele, A. B., Dugan, J. J., Safe Handling of "Reactive" Chemicals, Chemical Engineering, Apr. 20, 1959, pp. 157–168.
2. Liquid Propellant Test Methods Recommended by the Joint Army-Navy-Air Force Panel on Liquid Propellant Test Methods: The Liquid Propellant Information Agency, the Johns Hopkins University, 8621 Georgia Avenue, Silver Spring, Md. (Availability restricted.)
3. Nawiasky, Paul; Ebersole, Fred; and Werner, Jesse, Explosive Reaction of Diazonium Compounds with Sulfides of Sodium, Chemical and Engineering News, July 25, 1945, p. 1247.
4. Case Histories of Accidents in the Chemical Industry, Vol. 1, 1962, Manufacturing Chemists' Association, Inc.
5. Chemical Safety References, Data Sheet 486 Revised, published by National Safety Council.
6. National Board of Fire Underwriters Research Report No. 12, Nitroparaffins and Their Hazards.

7. National Board of Fire Underwriters Research Report No. 11, Fire and Explosion Hazards of Organic Peroxides.
8. Kuchta, J. M.; Martindill, G. H.; Zabetakis, M. G., and Damon, G. H., Flammability and Detonability Studies of Hydrogen Peroxide Systems Containing Organic Substances, Bureau of Mines Report of Investigations 5877.
9. The handling and Storage of Liquid Propellants, March 1961, Office of the Director of Defense and Engineering.
10. Robinson, Clark Shove, Explosions—Their Anatomy and Destructiveness, Department of Chemical Engineering, Massachusetts Institute of Technology; Lieutenant Colonel, Ordnance Reserve, U.S. Army.
11. Processing Under Extreme Conditions, Industrial and Engineering Chemistry, Vol. 48, p. 826, May 1956.
12. Albisser, R. H., and Silver, L. H., Safety Evaluation of New Processes, Industrial and Engineering Chemistry, Vol. 52, p. 77A, November 1960.
13. Van Dolah, R. W., Evaluating the Explosive Character of Chemicals, Industrial and Engineering Chemistry, Vol. 53, p. 59A, July 1961.
14. American Chemical Society Monograph No. 139, The Science of High Explosives by Melvin A. Cook (Reinhold).
15. Cambridge Monographs and Physics, Initiation and Growth of Explosion in Liquids and Solids, Bowden, F. P., and Yaffe, A. D., Cambridge University Press 1952.
16. Bowser, M. L., and Gibson, F. C., Pulse-Forming Circuitry for Explosives Research, Bureau of Mines Report of Investigations 5985.
17. Martin, Joseph J., Tert-Butyl Peracetate—An Explosive Compound, Industrial and Engineering Chemistry, Vol. 52 No. 4, p. 65A, April 1960.
18. Explosives, Propellants and Pyrotechnic Safety Covering Laboratory, Pilot Plant and Production Operations, U.S. Department of Commerce, Office of Technical Services AD 272424.
19. Siemens, A. M. E., The Hazards of Organic Peroxides, British Plastics, July 1962,
20. Griffin, D. N., The Initiation of Liquid Propellants and Explosives by Impact, presented at American Rocket Society Propellants, Combustion and Liquid Rockets Conference, April 1961.
21. Tomilson, W. R., Jr., and Audrieth, L. F., Uninvited Chemical Explosions, Journal of Chemical Education, November 1960.
22. National Fire Protection Association, Hazardous Chemical Data, No. 49M May 1961.
23. Bellis, Maurice, P., Hazardous Chemical Reaction, The Hezagon of Alpha Chi Sigma, October 1949.
24. Douglas, R. J., and Thompson, C. E., Some Studies in Chemical Fire Hazards, Oklahoma Enginering Experiment Station Publication No. 73, November 1949.

Safety Design Considerations for Production Equipment

WILLARD A. DUDLEY, *Safety Engineer, Eastman Kodak Co.*

Well-informed, aggressive and progressive safety engineers and management people are all generally agreed that it is not enough to assign an operator to a production machine and tell him that he must work safely— that he must not put his hands into the point of opera-

tion while the machine is in motion. The safety engineer has learned not to rely on this method. He has learned, in many cases the hard way, that no human being is always reliable. Therefore, all aspects or facets of safety must be taken into consideration in the manufacture and placement of a piece of equipment and in the production line.

This must not—and cannot be the responsibility of any one person such as the safety engineer. It can only be accomplished satisfactorily by a smooth working team consisting of the machine design engineer, tool designers, production supervision, the industrial engineer as well as the safety engineer. In many cases, it may be well to enlist the aid of an experienced operator.

We are basically concerned with the safe design and construction of the machine itself—guarding of the power transmission—the proper and safe design of the tools or dies used; and finally, safety at the point of operation. When considering these different elements, we should make every effort to obtain 100-percent protection for our operators 100 percent of the time.

The machine tool manufacturers are earnestly aware of the need to design and build their equipment so that the component parts have ample inherent strength to prevent breakage under normal operating conditions; in many cases, they include repeated overloads of more than 50 percent. Here engineering theory, coupled with a great deal of practical experience, dictates how to design and build the parts of a machine to withstand the loads to be imposed upon them. This is primarily the responsibility of the machine design engineer and there should be no need to further dwell on it at this time.

Now as to power transmission guarding, many standards, codes, and articles have been written on the subject. All of these describe various methods of protecting employees from the hazards presented. Here we must not only be concerned with the safety of the operator alone, but of the handlers, maintenance men, and other personnel who have occasions to work around or near the equipment involved. They, too, must be protected 100 percent of the time. Today, many machines are designed so that the transmission source is completely enclosed within the framework or housing of the machine. This is ideal, complete enclosure. However, many times we will see a guard over a V-belt and pulley; for instance, covering only the front side, leaving the back completely open. This creates a booby trap for the unsuspecting person who may place his hand over the edge of the guard at the nip point. This is not complete protection, although it may comply with the minimum requirements of some of the standards or codes.

We should also take into consideration the need to construct these guards with ample strength or ruggedness to withstand the abuse to

which they may be subjected. For instance, will a flywheel guard withstand and contain the flywheel should the shaft fracture and allow the flywheel to fall? Will they withstand abuse often subjected by power handling equipment such as forklift trucks, and the like? These are just some of the questions which we must ask ourselves when considering the designing and adequacy of our transmission guarding. Here no effort should be spared to protect those who may accidentally or inadvertently come into contact with a source of power transmission.

Tool design and die design for production equipment is a phase which is often overlooked by the design engineer as well as the safety engineer. This is an extremely important function when designing safety into our production equipment. The American Society of Tool and Manufacturing Engineers have, within the last 5 or 6 years, given considerable attention to safety in tool and die design; this attention is very much in evidence in their Society's handbook. The latest revision of American Standards Association Code B11.1, entitled "American Standard Safety Code for Power Presses," contains considerable information which should be taken into consideration when designing a power press tool or die. Here they point out the necessity of not only considering the safety of the operator, but also the die setter and maintenance man. Obviously, there are certain fundamental factors to safety or production personnel which must be considered and incorporated into the design of a particular tool or die. Will the machine be fed by hand or by gravity; will it be semiautomatic or automatic? Will the raw material be in sheets, strips, or coils? How will the finished piece be removed and how will scrap be removed? All of these questions must be asked while designing and constructing a tool or die so as to eliminate or minimize all possible hazard to our operators. Much can and should be done in this field of design to simplify our next problem—that of the actual point of operation.

Although machine tool operations do not produce the greatest number of employee injuries, the injuries associated with machine tool operations are usually of a serious or costly nature. There is a need, therefore, to insure that all practical safeguards are provided. When we are considering these safeguards, our goal should be that of providing maximum protection for the operator. We should not be content until we have reached this goal.

I should like to refer again to the ASA B11.1 code on power presses in order to point out the present-day theory of point-of-operation guarding. I quote from the foreword of this code:

"The safeguarding of power presses has been complicated by the wide variety of operations and operating conditions due to the variations in the size, speed, and type of press; size, thickness, and kind of

pieces to be worked; design and construction of dies; required accuracy of the finished work; skill of operators; and length of the run. Because of these varying factors, a wide variety of feeding methods and point-of-operation guards or devices has been covered in this standard.

"This revision of the standard has been developed on the premise that maximum safety can be obtained by providing the means that made it unnecessary for the operator to place his hands or any other part of his body into the point of operation. This can be achieved by:

"1. Automatic or semiautomatic loading and unloading of the dies, with proper point of operation enclosure guards; or

"2. Limiting any point of operation opening to ¼ inch; or

"3. If the methods outlined in (1) and (2) cannot be applied, auxiliary protective devices should be used to control access to point of operation. In addition to the use of safety devices, full consideration should also be given to the use of hand tools or feeding and stock removal methods, which would make it unnecessary for the operator to place his hands into the point of operation."

The last statement is of considerable importance—make it unnecessary for the operator to place his hands into the point of operation. This is the present-day philosophy of power press guarding. But do we need to confine it to power presses only? I am sure that it can also be applied to other types of production equipment. If this theory is considered when the machine and tools or dies are designed and built, I am sure that in a large percentage of cases it can be accomplished.

If it is unnecessary for an operator to reach into the point of operation, complete enclosure guarding or its equivalent can be installed. This is the type of protection which I referred to earlier—100-percent protection 100 percent of the time.

I have no idea how many of you have witnessed a hand amputation on a piece of equipment which did not offer this type of protection. But I have—and I do not ever want to witness it again.

There can be no compromise; we cannot afford it. Guards or guarding devices which offer only 50-percent protection 50 percent of the time, or 50-percent protection 100 percent of the time, must not be considered.

Machine guards when properly constructed and maintained provide operator protection and, in most cases, will not affect the output of a machine. There are certain things which we must consider when designing and building these guards. The need for visibility at the point of operation will greatly influence your choice of material. If visibility is of prime importance clear plastic may be used, but here care must be exercised to be sure that the plastic is not subjected to

impact or severe abuse. Expanded or perforated metal may also be used. And if there is no need for visibility, solid sheet metal is preferred.

The placement of the guards in relation to the danger area will govern the size of the openings in the guard. The closer the guard is to the danger area, the smaller the openings can be. We often overlook the question of whether the operator will be a male or female. This is important because of the difference in the size of the fingers. Obviously, the openings should be smaller in the guard on a machine where a female operator is employed.

At this time, it may be well to point out also that the placement of a female operator on a machine should also influence your design considerations in the placement of the work, the removal of the work, the position of the operator—the placement of the pieces to be processed, etc. Many times these are completely overlooked and as a result make the job more difficult or hazardous for the female operator and may even make it easier for her to work unsafely than to work in a safe manner.

Complete enclosure guards should be built to withstand the abuse to which they are often subjected. A flimsy, light-weight guard will soon bend out of shape or dislodge and its effectiveness be considerably reduced. Complete enclosure guards must also be properly maintained and kept in place at all times.

In cases where complete enclosure guards cannot be used, various devices have been developed to protect the operator and are readily available on the market. These devices include: two hand controls, sweeps, electric eyes, various interlocking gates, etc. Some of these have been on the market since 1920–21. Still, accidents and amputations continue despite these efforts. Why? Because most people buying and installing these devices do not follow the maunfacturers' instructions; provide no continuing maintenance; mount them on equipment for which they are not intended; or allow operators to tamper with them or disconnect them. In many cases it is just a situation of not enforcing their use.

The design of the machine will greatly influence your decision as to which one of these devices should be used. Does it have a positive type clutch or friction type clutch? What kind and size brake is provided? With intelligent selection, proper installation, careful maintenance, and enforcement of their use, these various devices can be used and will offer good, safe protection.

We have considered briefly the various safety design considerations with which we should concern ourselves when designing and building production equipment. It is important that both the efficiency and

safety requirements of the machine be considered. It is recognized that certain machine operations cannot be completely enclosed isolating the hazard from the operator or the operator from the hazard. However, it was pointed out that there are many devices available which can offer good protection if adequate preplanning and followup are employed.

Good safe operations are the result of good design and planning by a team of men dedicated to the elimination of accidents. During all phases of design, the team should keep in mind that they should at all times make every effort to provide maximum protection to the operator for a maximum amount of the time. Or as I said previously, 100-percent protection 100 percent of the time.

Safety Design Considerations for Noise Abatement in Facilities and Equipment

V. H. Hill, *Engineering Service Division, Engineering Department, E. I. du Pont de Nemours & Co., Wilmington, Del.*

We are interested in noise control in industry for two reasons. First, excessive noise can cause permanent and irreversible damage to a worker's hearing mechanism; and second, it can interfere with speech communications. Both of these conditions are not compatible with a good safety program. In the first case, we want to protect a worker against the loss of a physical facility; namely, his hearing. In the second case, we want conditions which promote good speech communications, especially during times of emergency. It takes noise a long time to cause permanent injury to hearing, in the neighborhood of 10 years except for very high levels. Hearing loss due to exposure to excessive noise does not seriously interfere with one's ability to carry on speech communication until it exceeds 15 decibels at 2,000 cycles per second and below. The concern of the safety men is "when will this point be reached?" If excessive noise is causing a worker to gradually lose his hearing acuity, who can say when the time will come when he will miss an intended audible signal which will result in a hazardous condition to him and/or his fellow workers.

Even though it has been known for many years that excessive noise can cause injury to hearing, accurate criteria have not been developed separating safe from unsafe levels of noise. Enough studies have been made, however, to establish criteria upon which a hearing conservation program can be initiated. Such criteria are based on group reaction. Individual reaction can only be determined by audiometric measurement of an individual's hearing acuity. It follows,

then, that the medical department is responsible for detecting employees who are supersensitive to noise.

Whether the noise is to be reduced, personal protection used, such as earplugs or ear muffs, or the noise sensitive person removed from the area, is determined on an economic basis. With this approach to hearing conservation, it is obvious that a very accurate design goal is not so critical since the borderline cases are determined by audiometric testing, which is the only accurate basis. It is suggested that you study the literature and establish your own criteria.

From a safety standpoint, we should emphasize *noise reduction*, since personal protection with earplugs or ear muffs, or removal from the area, does not correct a dangerous speech communication problem.

If we are to emphasize noise reduction then, what is the most effective program to this end? A look at the large number of existing noise problems might lead one to a pessimistic attitude.

Experience has led to the brighter side of this picture. Since modern industry requires rapidly changing production facilities, it has been found that by controlling noise on all new facilities real progress can be made in noise control. Of course, existing critical noise problems should be corrected, but not at the expense of work on new equipment. Another reason for concentrating our efforts on new equipment is the new designs themselves. As engineers we are continually striving to avoid over design. As a result, we minimize weight of buildings and equipment, run equipment at maximum speeds, and minimize space requirements. This is, of course, in the direction of good engineering design, but is sure to lead to excessive noise—probably even more noise than that produced by existing equipment unless we apply known principles of noise control.

The next question is, How do we go about preventing noise problems in new equipment or processes? One of the first things to do is to establish noise specifications. A noise specification should establish the limiting value of noise of equipment and recommend methods of measuring and reporting it. The Du Pont Company has been using a noise specification since 1956.

Another important step in preventing new noise problems is to publicize existing noise problems. This can be done by making a noise survey and publishing for your staff the noise levels of existing equipment. This will help them to develop a feel for the type of equipment and operating conditions that might cause excessive noise.

Last but not least, designers should have a specific procedure for checking noise control on final plans and specifications to be sure no noise problem has been overlooked or crept into the job in the development stage.

The remainder of this article will concern case histories of typical problems and solutions.

A 1/4-inch steel plate is a very common industrial material. When struck it rings like a bell. Does it make sense to construct machines of this material if the machines are to be struck constantly, such as with plastic cutters, explosions in combustion cylinders, unbalanced rotating parts, etc. As far as noise is concerned, the answer is obviously no. As far as *economics* are concerned, however, the answer is yes. To tailormake machines to do a specific job, it is often expedient and cheaper to use steel plate and weld the sections together, rather than to make patterns and cast the parts. It is not necessary to stand in the way of progress to control noise. This same piece of steel plate when damped with 1/8-inch damping felt and 1/8-inch steel restraining plate makes only a dull thud when struck.

This type of noise radiation is that easy to stop. Strike your noisy machines with a hammer. You will find many surfaces that are excellent noise radiators. It is our job to make them inefficient noise radiators.

Let's look at some examples of this approach. Figure 1 (see p. 388) shows a 2,000 hp. drive gear that radiated noise at a level of 111 db 18 inches from the gear. The cover was damped with felt and the base with sand; the noise was reduced approximately 25 db. Figure 2 shows the gear after treatment. Notice the nuts which hold the restraining layer and damping felt in tight contact with the gear cover. Figure 3 shows the type of gear we are discussing. The cover is removed in this photograph.

Electric motors of the two-pole 3,600 r.p.m. variety are another common noise problem. Ventilating air enters each end and is discharged at the center near the floor. Noise is generated inside the motor but escapes by means of the ventilation air passages. Figure 4 shows how the bearings have been moved outward and the frame extended upward to allow for the acoustically lined ventilation passages. A noise reduction of approximately 20 db can be accomplished with such a modification. A lot of pushing is needed by industry to get the smaller motors modified in like manner. By smaller motors, I mean those under 300 hp.

High speed, high pressure fans are another common producer of excessive noise. Figure 5 is a typical example. These are the so-called paddle-wheel type industrial exhausters. Note the steel plate noise radiators in this machine. When handling high volumes at high pressure, such as 40,000 cubic feet per minute at 50 inches of water, these fans can produce noise in excess of 100 db. Figure 6 is a centrifugal compressor which can do the same job quietly. There

are two reasons why this machine is more quiet. One, it is made of cast iron which is a less efficient noise radiator than steel plate; and second, the deceleration area between the impeller tip and the collector ring allows the gas to slow down and less turbulence is created in the collector ring.

Plastic cutters are another common producer of excessive noise. By using an impeller which produces a slicing instead of a chopping cut, the noise and shock to the machine can be minimized. Figure 7 shows a cutter which produces a slicing type cut. Air flow through the cutter should also be minimized to prevent excessive siren type noise, which is caused by the impeller chopping the air stream. All parts of the cutter should be of the dead type construction, previously discussed. The cutter should be vibration isolated from its base or the base should be of the dead type construction. Inlet and discharge ducts should be vibration isolated from the cutter. Any openings in the cutter should be muffled.

Pressure reducing valves are another common producer of excessive noise. When the inlet pressure is more than twice the discharge pressure, sonic velocity is produced in the valve. This is apt to cause high noise radiation from the valve body and the downstream piping. Figure 8 shows one way of controlling this type of noise. This shows a muffler at the discharge of the valve which reduces the noise in the gas stream. The valve and pipe between valve and muffler is enclosed in an acoustically lined box to absorb the noise. The valve should be a heavy one with heavy trim and guided stem to avoid excessive maintenance from vibration.

This short discussion is only hitting the high spots in the large problem of industrial noise control. I am convinced that noise control can be accomplished at reasonable cost, and the sooner it is done the better. The alternative is for all of us to go about our daily work wearing ear muffs with built-in walkie-talkie equipment. This doesn't appeal to me. Actually, if a machine is vibrating so badly that it creates noise in excess of 100 db, we have economized a little too far and we had better back off a little. I predict that with intelligent use of known techniques for noise control, particularly vibration damping, we can have our cake of close design and eat it too; that is, be able to control the noise to a point where we can live with it without having to wear ear protection.

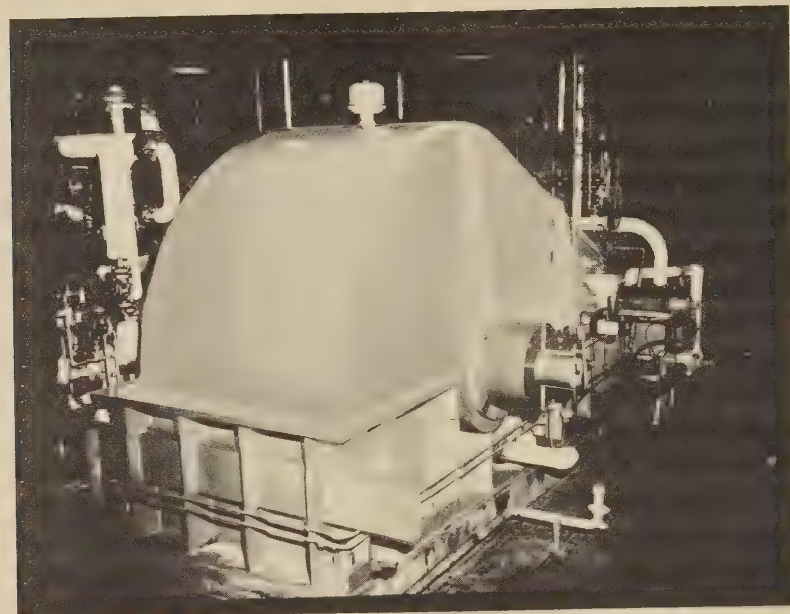

Figure 1

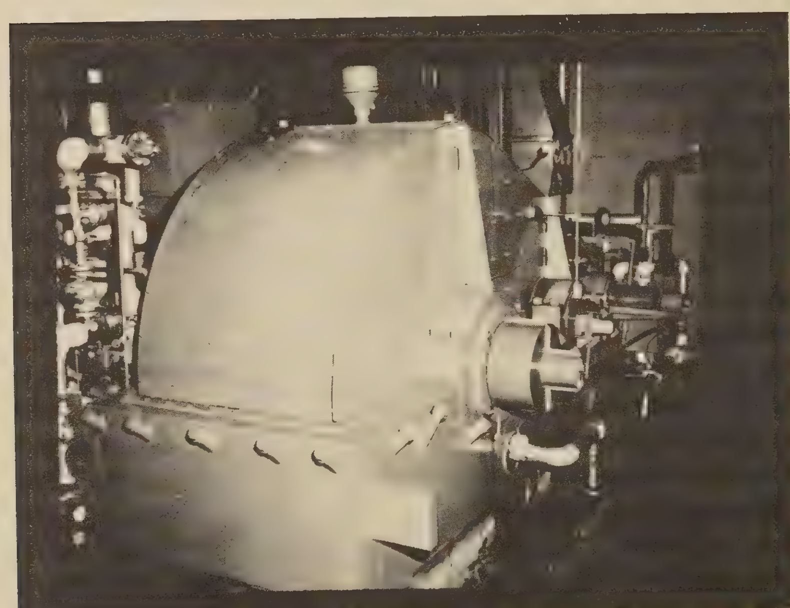

Figure 2

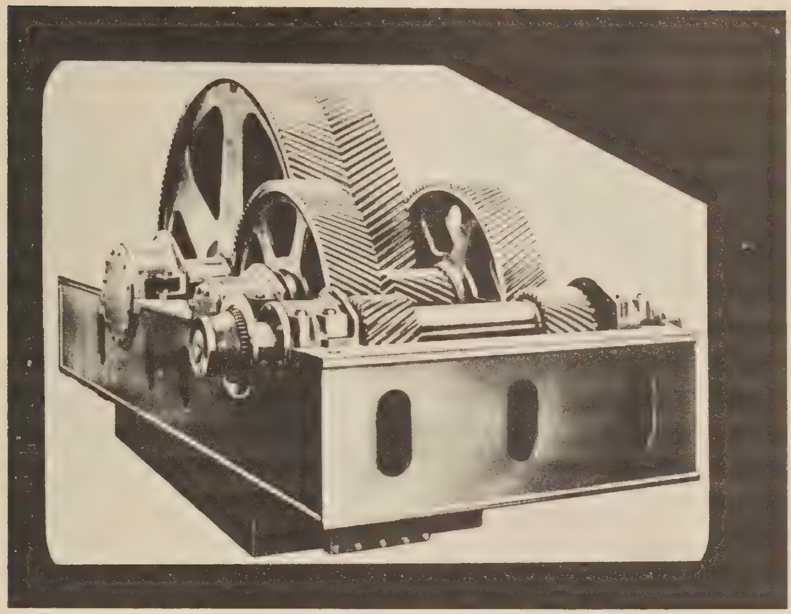

Figure 3

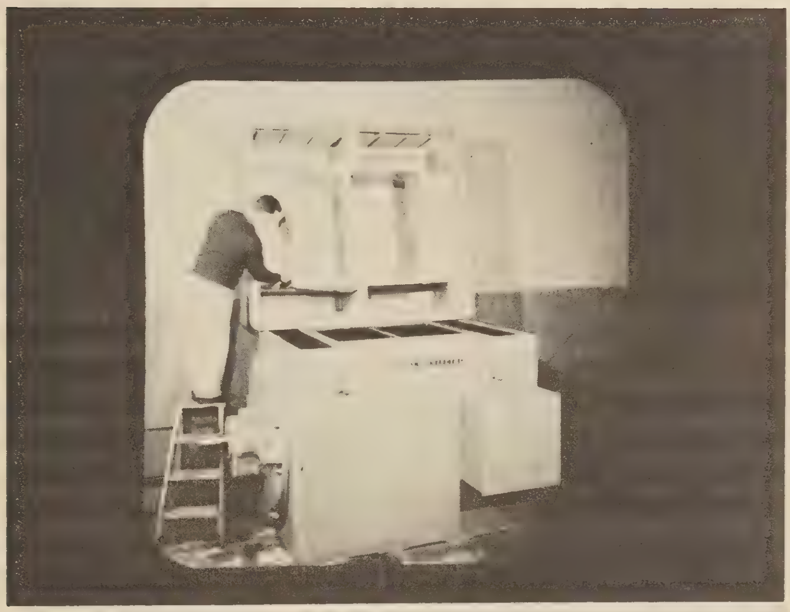

Figure 4

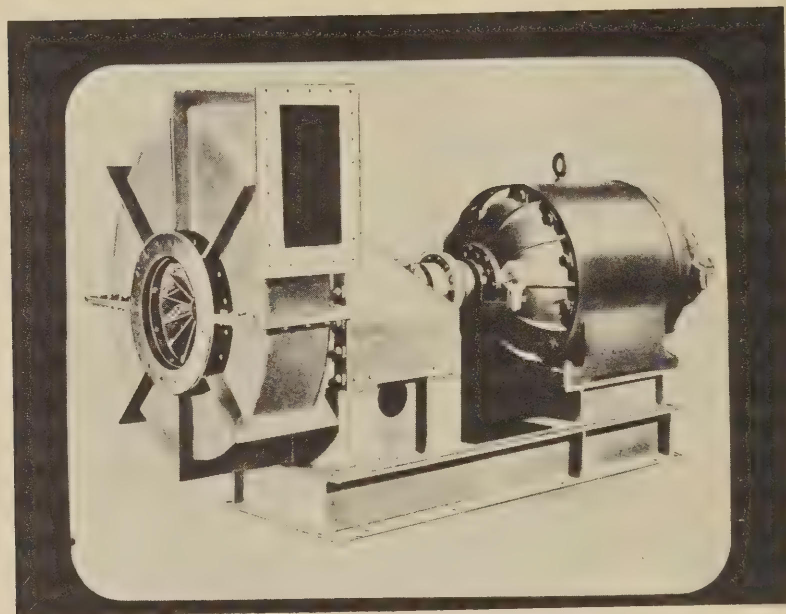

Figure 5

Figure 6

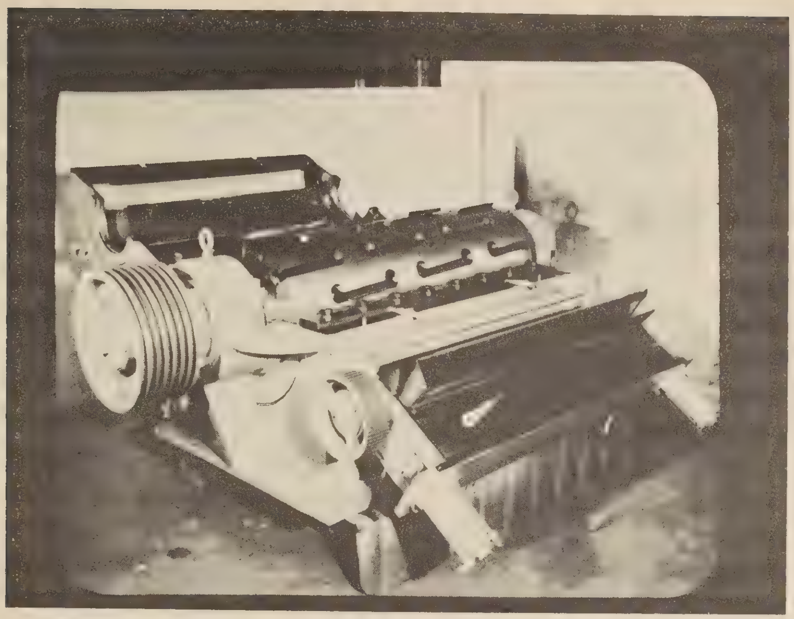

Figure 7

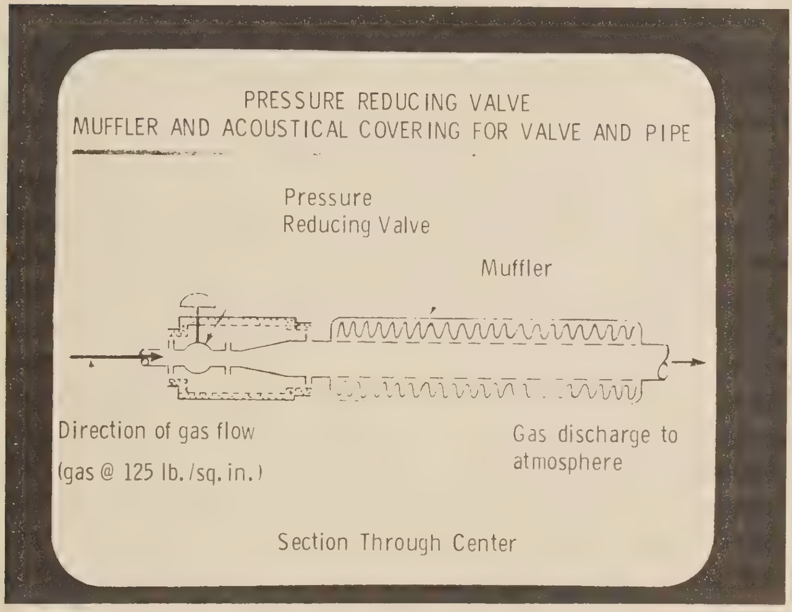

Figure 8

"Accident Prevention in Trades and Services." Panelists—John D. La Mothe (at lectern), Educational Institute, American Hotel and Motel Association; James D. Rogers (session moderator), Hotel Safety Trade Group, New York City; Vernon E. Cordell, National Restaurant Association; and Bruce Shinabarger, American Retail Federation.

WORKSHOP: ACCIDENT PREVENTION IN TRADES AND SERVICES

Moderator: JAMES D. ROGERS, *Managing Director, Hotel Safety Trade Group, New York, N.Y.*

Programs and Training

JOHN D. LA MOTHE, *President, Educational Institute, American Hotel and Motel Association; and Manager, Du Pont Hotel, Wilmington, Del.*

My subject today is "Programs and Training," and I direct my remarks specifically to the hotel segment of the service industry because this is my life.

Let me say at the outset that a fundamental for any successful safety program is the sincere belief by top management of the absolute necessity for a safety program which will produce outstanding accomplishment. In the area of supervision and management, experience teaches us that we get precisely the results that we require, no more, and no less. Thus the requirement for safety of operation established by the sincere belief or conviction of top management sets the policy, the philosophy, the tone of the entire organization.

Webster's Dictionary defines safety as "condition of being safe; freedom from danger or hazard." It defines security as "freedom from exposure to danger." Obviously, there can be no such happy situation in life as "freedom from exposure to danger," because exposure is inherent in everything we do during waking or sleeping hours. But safety—the freedom from hazard—is attainable provided top management sincerely takes the flat position that there is no such thing as an accident—that all injuries are caused by the thoughtlessness, or the carelessness, or the act of someone. That top management, and by delegation, all levels of supervision, have complete responsibility for the safety of employees—and of property.

That every employee bears the responsibility to work safely. That like the four legs which successfully support a chair, the four equally important efforts that result in successful operation are safety, production, cost, and quality of product. That an employee who is a good housekeeper and works safely is almost inevitably an efficient

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operator. That injuries are intolerable, unnecessary, and avoidable if the working equipment is properly protected; the working procedures are thoughtfully established; and every employee is carefully trained to work safely.

With this philosophy established, our first step is to establish a central safety committee consisting of the top level department heads—such as the chef, housekeeper, engineer, resident manager, food and beverage manager and maitre d'—with the general manager as the chairman. This committee meets once a month and serves as the policy setting and planning group as well as the followup medium in the implementation of our program. In my hotel we have the advantage of utilizing a Du Pont Company safety engineer to meet and work with us. In almost any hotel I would suppose that their insurance company would be delighted to provide such help.

Our particular program requires a safety and housekeeping inspection monthly, area by area. The group which makes this inspection is composed of operating supervision, at least two line employees, and the safety engineer. A detailed report of their findings is issued and involves any unsafe conditions noted such as electrical equipment not properly grounded, fire doors working improperly, operating equipment not adequately guarded, spills on floors not immediately cleaned up, working procedures which appear hazardous, unsafe acts on the part of employees which indicate lack of safety responsibility, blocking of exits, condition of fire extinguishers, and poor housekeeping. This report is reviewed by the central safety committee together with the report on resultant action taken by the area involved.

A second facet of our program is the scheduling of safety meetings by all members of supervision with their people. These are held monthly and brief reports must be filed listing the subjects covered and the employees attending—by name. These meetings normally last one-half hour, and for 8 months of the year are individually prepared and led by each member of supervision on subjects that are of specific interest in his operation.

These meetings are considered to be a specific part of our program to indoctrinate all employees with their safety responsibilities, and to train them to fulfill those responsibilities. Thus, these meetings may deal with many specific subjects such as lifting properly, the prompt reporting and treatment of minor injuries, discussion of specific safety rules such as "no running," "no horseplay," the proper operation of cutting equipment or hot equipment, the proper way to handle trucks, the proper procedure for handling range fires, discussion leading sessions soliciting the suggestions of employees as to problems of safe operation in their areas.

In addition, so-called "quickie" or 5-minute meetings are called—right in the operating area—to inform and discuss specific developments, situations, or injuries which have occurred. An example of this is the series of quickie meetings we called recently to discuss the fall of a waitress who, as a result, cracked the bone in her arm. This lady was serving a late dinner group and, on leaving, she hurried through a quarry tile floored pantry which had been mopped and was still wet. Obviously, she slipped and fell. The story we wanted to get across was—don't hurry, walk extra carefully when wearing rubber heels, mop floors at the proper time, always place signs warning of wet floors.

Each quarter, however, we hold a series of larger meetings by an assigned individual, covering a carefully prepared program of general interest. As an illustration, at this time of the year we might review off-the-job injury hazards as related to vacations or do-it-yourself homework. I give this particular illustration of a subject because we believe that the prevention of off-the-job injuries is of equal importance to preventing on-the-job injuries.

In the first quarter of the year, as the manager, I hold a series of larger meetings to include all employees. In these meetings, we review our operating results and our safety performance for the previous year, and establish goals for the current year. It is my special purpose to instill in the minds of all employees that we are completely serious in our concern for safety—for a no-injury record on the plant, for a no-injury record off the plant. We discuss the humanitarian aspects of safety—the elimination of pain, suffering, family dislocations and inevitable expense. We also discuss the good business aspect of safety as to interrupted production, the effect on guest service and sometimes the guests themselves; the costliness of paying for lost time, which we do; the effect on insurance rates. We especially stress the importance of safety attitude on the part of every employee, and I provide a homely yardstick of success in this area. It is my belief that any strongly held conviction rubs off on one's family and friends. This is true in the area of politics and religion, and, by the same token, safety. If one's children show evidence of having assimilated the need for safety, one has indeed developed a sincere safety attitude. I have many times told the true story related by my neighbor many years ago. She said that one day my daughter—who was then 8 or 9 years old—came into her kitchen and in a horrified voice said, "Mrs. A. that pot of boiling water on the stove should have the handle turned in, Ronnie (her 2-year-old baby) could pull that over and scald himself." Believe me, this made an impression on her that she never forgot—and I was gratified. Obviously, my company safety training had rubbed off on my family.

Thus far, I have discussed mostly our safety meeting program. Obviously, many other things must be done. Operating equipment must be properly installed, guarded, and receive the approval of our safety engineer before it is released for use. Working procedures and methods must be carefully established by supervision to eliminate every possible hazard. It is the unhappy fact that hindsight is better than foresight, and it always seems tragic to me that someone has to sustain an injury before we recognize a situation which should have been foreseen. This is one reason we believe that our safety inspections by a group are most effective in introducing outsiders with a new look at the operating area. Sometimes these people see things and ask questions that haven't occurred to the person long employed in that area. After all, if familiarity with a job or an area doesn't breed contempt, it certainly can readily breed a routine outlook. We also have the advantage of an annual safety and fire survey by Du Pont safety engineers who are expert in this area. These gentlemen produce a detailed report of their observations, their impressions, and of each specific recommendation dealing with unsafe conditions found. We, in turn, answer in detail reporting our action in each instance. So much for inspections.

The new employee, his orientation and training, is a matter of concern. Safetywise, he must be immediately taught our philosophy and that we are serious about it. He must clearly understand our definitions of what a major injury is, a sub-major injury, a minor injury—and that our entire safety record depends on him. It only takes one injury to one employee to ruin a beautiful record and effort on the part of many people. We like to take the Alcoholics Anonymous approach and teach each individual employee to stay safe for today.

The new employee must then become familiar with our safety rules and regulations. He must be introduced to the operating equipment in his area, the manner in which it should be used, should be cleaned, should be shut down, or when necessary, locked out. The working procedures and safety rules of his job are explained and he is then assigned to a selected, experienced operator for on-the-job training. It is then up to supervision to observe and follow up, to talk to and work with the employee from day to day, to assure himself that this new employee is well trained and understands his responsibilities.

One excellent means of safety training is the inclusion of employees—on a rotating basis—on their area safety committees. An especially valuable function of these committees is the investigation of injuries to determine precisely what happened and why. While willful violators of our safety rules and procedures are dealt with firmly, and in certain cases severely, the primary intent of the investigation

is to prevent similar future injuries rather than to establish culpability. This approach underlines our belief in preventive safety rather than after the fact correction.

A variety of programs to continually stimulate and sustain interest in safety involve bulletin boards, contests of various descriptions, safety awards providing prizes for every employee, and, of course, continuous use of our house publication. The prize awards contest is too complex to describe accurately, but suffice it to say that graduated prizes entitled General Managers Award, President's Award, and Board of Director's Awards are given after the facility achieves a given number of no lost-time injury days. The titles of the awards indicate the top management interest—and, as a matter of fact, the presentation to our employees is normally made by the appropriate individual personally—even our President, or a member of our Board of Directors.

At the outset of these remarks, I stated that a fundamental necessity was top management's sincere belief and conviction in such a safety program to produce outstanding accomplishment. Your question might very naturally be—if your hotel has a program of this sort, what is your accomplishment?

On December 15, 1959, we sustained our last major—or lost time—on-the-job injury. As of that date, we had successfully accumulated 2,679 days or 5,104,800 safe man-hours. This was recognized by the National Safety Council with an award for the "World Record in the Service Industries." We began over again and have so far won our General Manager's and President's Awards. If all goes well, we should win our Board of Director's Award in September or October. This will constitute just short of 5 years without a lost-time injury. Now, I have seen figures for a group of New York City hotels of our size which gives their lost-time accident frequency rate for 1963 as 10.94 injuries per million man-hours. If we applied this rate to our safe hours worked since December 15, 1959 of 2.550M hours, we would have sustained 28 lost-time injuries instead of none. I tell you this with considerable pride in every one of my people and their accomplishment. But I do so only to indicate that such a program as I have described does work.

In conclusion, let me quote a statement made by the Chairman of our Board of Directors as long ago as 1946. I do this because, in a few words, it illustrates that foundation we must have for accomplishment. "We, in the Company, long ago concluded that the safety of employees is of the greatest interest to management, ranking in importance with production, quality of product and costs. We have found that maintenance of safe operating procedures in our plants is of benefit far

beyond any resulting dollar savings, the human values involved being of greater importance to both employer and community. Also, the acceptance and practice of fundamental safety principles by management and men, with the reduction of personal injuries to a minimum, injects an element of teamplay which does much to foster a spirit of friendly cooperation throughout our Company."

An Effective Customer Accident Prevention Campaign

B. W. Shinabarger, *G. C. Murphy Company, McKeesport, Pa.*

As business or association executives, you are vitally interested in increasing profit, which can be accomplished by reducing operating costs and maintaining good customer relations. An effective accident prevention program which reduces the number and severity of customer and employee accidents, resulting in lower insurance costs and improved customer and employee relations, helps to achieve these goals.

Today, we will offer the ingredients for an effective accident prevention program. Although our comments will be primarily directed toward the prevention of customer accidents, an effective campaign will help prevent all accidents.

The results which an effective accident prevention campaign have on an insurance premium should whet your appetite for further information. The average company can expect a 25 percent reduction in public liability insurance costs as a result of an effective accident prevention campaign. This 25 percent reduction can mean savings of $500,000 a year for a large company.

An effective accident prevention campaign includes these items.

1. Active top-management support.
2. Analysis of previous accidents.
3. Accident prevention procedures.
4. Effective loss control.
5. Insurance company cooperation.

A. Top Management

An Effective Program Is Not Possible—Without the Active Support of Top Management.

Convince Top Management of the Campaign Results

Before they can be expected to participate actively, top management must be convinced that the campaign results—improved customer relations and a reduction of insurance expenses—justify the expense and effort involved.

How To Obtain Management Approval

1. Present a résumé of claims and insurance premiums for the past 10 years. In all probability this résumé, which should include information on both customers and employees, will reveal a sizable increase in liability costs over the last 10 years. Many of you, particularly those in retailing, will be surprised to find that the *net* cost ratio of customer to employee insurance costs has increased and now varies somewhere from 1.75 to 2.50 to 1. This ratio in indicative of your accident problems; if the ratio is above 1.75, your customer accidents costs are excessive; conversely, if the ratio is below 1.75, such as 1.15 to 1, your employee accident costs are excessive.

2. Define the reason for increased cost by outlining the methods of claims payment or award. Employee accident costs are controlled by workmen's compensation laws which provide specific benefits, whereas customer accident costs vary according to: (1) the demand of the customer, which is indirectly related to the economy and the inflationary trend; (2) the geographical area in which the claim occurred; (3) the claims policy of the insurance carrier; and (4) the composition of a jury.

Customer awards are *not limited* except in unusual cases when a verdict is set aside as excessive, and, unfortunately, customer claims are subject to the ravages of time. For example, if formal action were filed today in Pittsburgh, the customer's case would not come to trial until 1970. Who, without a crystal ball, can predict the effect inflation and the jury will have on an award in 1970?

3. Project the saving in yearly insurance premium which results from this program. Insurance companies strive for net customer loss ratios between 45 to 70 percent. Obviously, a reduction of losses (made up of both paid and reserve claims) which results in a 35 percent loss ratio, should result in a substantial reduction of premium. (If it doesn't, fire your insurance buyer and use another insurance company.)

4. Indicate that the program requires no additional administrative expense because of the loss prevention service offered by most insurance companies.

5. Define "satisfied customer." A satisfied customer is a healthy, *not* an injured, customer. Customers come to buy the service which you sell, their safety depends on you. The effective accident prevention program promotes goodwill and results in sales increases.

Top management cooperation includes:

1. Sending letters and bulletins to administrative employees, signed by the company president, stating the program's ob-

jectives and showing the effect of the campaign on their personal earnings.

2. Representation at safety meetings.
3. Prompt acknowledgement and consideration of employee safety suggestions.
4. Inspection tours and contests. When management promotes such activities, employees become safety conscious and are more inclined to do their part.

B. Analysis of Accident Causes

An Effective Program Is Not Possible—Until You Know the Types of Accidents You Need To Eliminate.

To realize the greatest dollar benefit, the program must be directed toward preventing those accidents which cost the most money. A survey of customer accidents in *selected* trades and service industries indicates three types of accidents caused 61 percent of the accidents and 80 percent of the claims cost.

a. Falls on floors.
b. Falls on stairs.
c. Struck by objects (such as falling displays or stock trucks).

An accident prevention program must be directed toward the elimination of these accidents; for example, no specific emphasis should be placed on cuts from counter glass, which cause the greatest number of accidents in retail stores but result in less than 5 percent of the total claims expense and little or no discomfort.

Analyze the high cost claims in your company, then take specific action to prevent future accidents.

C. Specific Accident Prevention Efforts

Effective Accident Prevention Is Not Possible—Until Action Is Taken To Eliminate Hazards.

These are the common hazards and the cures, in retailing and related industries, by type of accident:

1. *Floor falls* are prevented:
   a. When merchandise, boxes and chairs are kept out of aisles.
   b. When debris, cigarette butts, and spilled liquids are cleaned up promptly.
   c. When floors or carpets are kept in good condition.
   d. When floor dressings are applied according to manufacturers' specifications.
   e. When snow or water is removed immediately.

2. *Stair falls* are prevented:
   a. When stairways are free of merchandise, trash, fixtures, ladders, and similar foreign objects.
   b. When patrons descending stairs have a minimum number of distractions, such as displays, signs, etc.
   c. When stair railings are secure and offer proper support.

A company in the trades and services industry recently lost a $20,000 jury verdict as the result of a customer fall. For some of us, the profit on $900,000 sales.

3. *Escalator accidents*

Although many of you do not have escalators, no accident is as dramatic and, at the same time, as costly as an escalator accident. The number of escalator accidents can be reduced when:
   a. Alternate treads are painted a contrasting color.
   b. Lights are installed under the bottom treads.
   c. The maximum running speed is limited to 90 feet per minute.
   d. Micro switches are installed.

All costly escalator accidents do not involve falls. In some cases, children's (and often adults') feet are caught between the edge of the tread and the skirt guard and are then drawn through the comb plate. We can't prevent this from happening, but we can minimize resulting injuries by:
   a. Installation of micro switches in the skirt guard—one pair (window type) about 13 to 18 inches up from the comb plate, and another pair (pressure type) right behind the skirt board about 4 feet from the comb plate.
   b. Mounting upthrust micro switches under the treads.

These micro switches will shut down escalators with 12 to 14 inches of overrun, normally a sufficient distance to prevent children from being dragged into the comb plate.

One major department store chain estimates micro switch installations have reduced insurance claims almost $1 million.

4. *Struck by an object* accidents are prevented by:
   a. *Proper displays*—
      (1) Secure displays so they won't fall.
      (2) Display light items on the top shelves; heavy items on low shelves.
      (3) Use a color differentiation between display bases and the floor.
   b. *Careful operation of hand trucks and carts.*—Experience dictates that once a customer is hit by a stock truck, you are negligent.

The seriousness of such claims makes employee truck safety training mandatory.

(1) Limit speed to a slow walk.
(2) Pull trucks through congested *customer* aisles; push them at other times.
(3) Do not overload trucks.
(4) Remove empty trucks from customer service areas.
(5) When possible, move stock during off-peak hours.
(6) Schedule periodic maintenance.

c. *Proper maintenance of revolving or swinging doors*

5. *Accidents in restaurant and lunch counter areas*

Specific attention must be given these items:

a. Pick up food, napkins, and litter periodically.
b. Remove empty trays and carts from customer service areas.
c. Train employees to work efficiently under pressure.

D. Effective Loss Control

An Effective Accident Prevention Campaign Includes—
Loss Control Through Maintenance of Adequate Records.

Even the most effective accident prevention campaign will not prevent those accidents which occur as a result of a customer's poor physical condition. The best defense against any claim is to prove the accident occurred solely as a result of the customer's actions.

Basic to this no-negligence defense are four important activities:

1. An organized, recorded maintenance schedule.
2. Written reports showing completion of this schedule.
3. Prompt and thorough investigation of all accidents, including completion of accident report forms.
4. Adherence to local building codes.

The best way to prove *organized maintenance* is through printed maintenance schedule. When this has been done, establishing the "prudence" of the operation with regard to maintaining clean premises is not difficult.

If you have escalators, elevators, or revolving doors, inspection records will help refute the plaintiff's claim of negligence.

Prompt investigation of an accident while all the conditions remain substantially unchanged and witnesses are available is of utmost importance.

A store has an adequate defense against unjustified customer claims when the area supervisor, the maintenance man, and an impartial customer witness have assisted in the completion of an accident report, indicating the floor, stairs, or counter was in a safe condition, and

there were no unusual actions on the part of employees or other customers. These reports can be used years later when suits, as a result of these accidents, come to trial. After these years, some employees have been transferred, others resigned or retired, and the memory of witnesses may be hazy.

Insurance company claims and loss prevention representatives and your legal counsel can assist you in the preparation of formal reports and records which have the greatest defensive value in court.

Adherence to Local Building Codes.—Claimants' attorneys often allege negligence based on violation of State or local building codes; therefore, *all* portions of your building (doors, stairs, escalators, revolving doors, etc.) should meet present code requirements.

Although code requirements are usually not retroactive, claimants often win verdicts based on violation of the present building code. Have your construction representative review present codes to determine structural changes needed to comply with them. Whether you make any changes is strictly a matter of judgment based on this question, "Does the amount of a possible award justify the construction expense?" There is no right answer; if you wink at a violation of the present code, you are taking a calculated risk.

E. What You Can Do for Your Insurance Carrier

An Effective Accident Prevention Campaign Is Not Possible—Unless You Cooperate With Your Insurance Carrier.

No one is more interested in reducing accident costs than your insurance carrier, whose retention of your insurance business and profit depends upon his ability to control and reduce your dollars of paid claims.

Help your insurance carrier and reduce your insurance expense by:

1. A complete investigation of all accidents.
2. Prompt completion of accident report forms, particularly the sections pertaining to impartial customer witnesses, maintenance reports, and area conditions. Prompt reporting will enable the insurance company to investigate and settle any claim where there is liability before the claim gets out of control and into the hands of a lawyer.
3. Discussing safety recommendations with the insurance company safety engineers.
4. Informing the insurance company of promotions or events that might produce unusual hazards so they can review plans and suggest ways to eliminate accident hazards.

5. Formation of safety committees in any company where there are more than 75 employees at any one location. These committees find and terminate accident hazards.

F. What Your Insurance Carrier Can Do for You

An Effective Accident Prevention Campaign Is Not Possible—Unless Your Insurance Carrier Cooperates With You.

Here are some things which the insurance company will do for you:

1. Plan an effective accident prevention campaign.
2. Submit detailed loss reports to be used to prepare news releases.
3. Conduct periodic inspections to control accident hazards.
4. Make elevator and escalator inspections to conform with State and municipal codes.
5. Provide safety posters.
6. Provide certificates and prizes for outstanding accident prevention efforts.

G. Conclusion

Accident prevention efforts in trades and services companies have been neglected because of a general feeling that sales increases solved all expense problems. Although sales are of prime importance, inclusion of many trades and services industries under the Federal Minimum Wage and Hour Law necessitated the need for rigid expense control. The time is "ripe" to present an action-type accident-prevention campaign to management which will reduce expenses. Your ability to convince management to participate controls the success or failure of the campaign.

To Convince Management—

A. Insurance companies should:
   1. Present loss prevention data and projected insurance costs, which illustrate how an effective campaign will reduce insurance costs.
   2. Offer additional loss prevention service, particularly to small insureds who, without help, have neither the time nor the know-how to conduct an effective program.

B. Insurance buyers and safety managers who are aware of the potential premium savings should:
   1. Consider their current program in light of recent economic developments to determine if their accident prevention program is comprehensive enough.

2. Project future claims and insurance expense so action can be taken if projected costs appear excessive.

C. Association executives should:

1. Form an association task force to provide educational material so small companies or individual owners understand the reason why an accident prevention program is desirable, then to assist them in planning and administering their campaigns.

Companies in trades and services will normally be motivated to promote accident prevention only when they realize the sizable premium savings resulting from an effective accident prevention campaign.

Two factors are necessary for any company to survive: (1) increased sales, and (2) expense control.

An effective accident prevention program helps get additional sales and controls a major expense. Begin an effective accident prevention campaign today; tomorrow may be too late.

Safety in Environment

VERNON E. CORDELL, *Director, Public Health and Safety, National Restaurant Association*

The subject assigned to the National Restaurant Association for this workshop session is "Safety in Environment." I would like to change this slightly to "Environment and Safety," and discuss the subject as it relates to the food service industry. Here it seems pertinent to paraphrase a Porgy and Bess selection—"We Got Plenty of Environment," for what industry embraces such a variety of hazards—mechanical cutters, choppers, mixers, grinders, slicers, meat saws; high and low pressure steam used in pressure cookers, urns, steam tables, and for cleaning; hot stoves, ovens, broilers, grills and griddles; open gas flame and red hot electrical heating elements; hot oils and melted fats, freezer storage rooms, breakable glassware, sharp knives, cleavers, floors made slippery by accidental spillage of fat or liquids? The food service industry probably has the greatest diversity of hazards of any business in the land.

Where does the food service industry stand in relation to other major industries in frequency of disabling injuries? Statistics taken by the National Safety Council from "Accident Facts," show that in 1962 41 major industries ranged from 0.98 disabling injuries per million man-hours to 35.8 with the median at 6.19. A sampling survey conducted by the National Restaurant Association during the same year resulted in an indication of a frequency rate of 16.82 for

restaurants. This figure is quite close to several others on restaurant operations received from other sources. The rating places us below 36 of 41 major industries in safety excellence. Only the lumbering, construction, "hard-rock" underground mining, marine transportation, and coal-mining industries had worse safety records than ours.

On the other hand, many major industries, generally regarded as highly hazardous, had much lower injury rates than ours. These included automobile manufacturing and the steel, chemicals, gas, foundry, ship building, and petroleum industries. This would seem to be a paradox. Why should these two conditions exist? To understand, I believe you should know a little more about the restaurant industry.

First, you should know that our industry consists largely of independent establishments, many of comparatively low annual gross business volume. Approximately 94 percent are independent or single-owner establishments, with 92 percent having a gross sales of below $100,000. (1) We are an industry whose establishments average only 14 employees each; (2) Many operate on the labors of three to six persons; (3) Unfortunately, we must depend to a great extent on unskilled workers of relatively little overall education; and finally (4) we are of a type which is generally considered, even by our employees, to be relatively nonhazardous, as opposed to their view of the "heavy" industries.

Why then does the food service industry stand so low in excellence of injury-frequency ratings and many hazardous industries so high on the scale? I believe that the reasons are these:

1. Our great diversity of hazardous equipment and procedures makes us much more injury prone than is realized.

2. Few restaurant operations are large enough to employ the full time safety managers, engineers, and other supervision which large industrial firms or complexes are able to afford. Here is where hazardous heavy industries score.

3. An unskilled, relatively uneducated employee, sometimes a "floater" type, frequently handles complicated and hazardous equipment in a restaurant kitchen.

4. In many cases, restaurant management, especially in smaller establishments, regards a kitchen operation as one step removed from a home kitchen and that disabling injuries are unlikely. Employees likewise do not take safety sufficiently seriously.

What must be done to rectify this situation? I believe that our efforts must be directed in two main directions. First, management must be made to realize:

1. The magnitude and seriousness of restaurant establishment injuries, involving both customers and employees.

2. His obligation to both the customer and to his employees.

3. The importance of an effective safety program to the continued success of his operation, through reduced claims and premiums and an efficient staff not rendered ineffective by lost time or disabling injuries.

4. The importance of convincing employees of their stake in the efficient low cost operation of the business to insure them job security. Both must know that business success is based on business volume which, in turn, is based on public confidence in the establishment; and management must realize also that a loyal and effective crew is the result of confidence in the efficiency of management and in a concern for their safety.

And second, the food service industry, working with other groups concerned about accidents in food service establishments, must identify hazards inherent in both facilities and equipment and in operating procedures and must:

1. Coordinate with equipment manufacturers to eliminate hazardous construction, improve safeguards and seek dissemination of use and maintenance instructions.

2. Coordinate with insurance companies, safety engineers, and facilities contractors on elimination of hazards resulting from faulty planning of building and equipment arrangement.

3. Coordinate the development of safe operating methods.

What is the NRA doing to assist in accomplishing these objectives? I'll give you a few examples.

1. A graphic program, aimed at the food service owner or top-level management, was presented to the general audience at our 1963 convention. This program has since been converted into a do-it-yourself presentation kit to permit restaurant associations, colleges, and universities teaching food service management, multiple unit companies, and others to reach present and future food service establishment operators.

2. A series of poster sets, considered specifically pertinent to the food service operation, has been coordinated with the National Safety Council for periodic release. New posters which are responsive to specific hazards identified as causing a significant pattern of injuries will be developed.

3. The NRA has cooperatively engaged in the development and distribution with the National Safety Council of the first of a series of Safety Data Sheets on food service equipment, consisting of useful basic instructions to guide the manager and employee in safe equipment use.

4. Other safety bulletins, checklists and tips have been and are being furnished to our food service operator membership to motivate them and guide the establishment and conduct of effective safety programs.

5. The NRA is presently participating on American Standards Association projects dealing with work injury measurement and customer injury statistics. And finally,

6. We suggest and encourage incentive programs which will result in premium reductions and increased employee productivity.

In conclusion, I would like to emphasize the fact that the individual is the key to our success in reducing hazards and accidents, not the environment. Whether management plans or fails to plan and the employee responds or fails to respond to the safety requirements of his job are the real determining factors.

WORKSHOP: SAFETY LEADERSHIP THROUGH STANDARDS

Moderator: CYRIL AINSWORTH, *Deputy Managing Director, American Standards Association, Inc.*

The Importance of Standards

RAYMOND F. MALE, *Commissioner, New Jersey Department of Labor and Industry*

We do not and will not have a published American Standard on safe people. This part of the injury equation requires our ingenuity for organization. But we do have published standards on safe places, and their use offers many advantages. They raise the average of all by boosting the least. This is the value that has been served, although not adequately, by establishing minimum wages. This is what we hope to accomplish in our fight for increased employment opportunity and in our fight against poverty, where raising the least is a need of national importance.

With respect to safety standards themselves, a number of particular advantages can be cited for our discussion today:

1. The very process of preparation brings organized wisdom into action to determine adequate protection for hazardous equipment, methods, and processes. The formulation can and does replace vague, varying, and ill-formed notions of protection.

2. Properly drawn standards guide and inform employers and employees as to what should be done to provide *reasonable* protection against the hazard dealt with.

3. Promulgated standards provide a basis for uniform enforcement by all of the field representatives of government agencies which regulate employment conditions.

4. Standards put employers on advance notice as to what will be required of them under the law enacted for the protection of their employees.

5. The method of standards writing can put to work technicians who have a knowledge of their field too specialized to be dealt with by the legislature.

Workshop panelists describe the importance of safety standards. J. C. Arndt, Simonds Abrasive Company (at lectern); seated l. to r., Cyril Ainsworth, American Standards Association (moderator); Victor E. Whitehouse, International Brotherhood of Electrical Workers, AFL–CIO; Raymond F. Male, New Jersey Department of Labor and Industry; and C. H. Elsby, Employers Mutuals of Wausau.

6. Standards which are issued by an agency of government can be updated, and otherwise revised as necessary, far more simply than requirements which are built into the law itself.

It is precisely for these reasons that the concept of administrative law has grown so remarkably in the last 30 years.

When I talk about standards here, I am not referring only to those published by the American Standards Association. We applaud the outstanding contribution to standards work that this organization has made. In fact, personnel of our department now serve on 10 American Standards committees. However, we do not always agree with, or limit ourselves to, published standards of the American Standards Association or other national organizations. We have found, in some cases, for example, that to secure a consensus compromises have been made which we cannot fully accept and still satisfy our obligations to administer the law. Our technical people believe, for example, that the American standard on industrial trucks does not go far enough. Our regulation, therefore, extends into additional areas.

We do not fully agree with all of the requirements of the National Fire Protection Association on liquefied petroleum gas and are modifying some of them in a regulation soon to be promulgated. Our engineers are not entirely in accord with the recommended requirements of the Compressed Gas Association and are in the process of redrafting them at the moment. In the field of construction safety, we were unable to find a standard complete enough to serve our purposes. So we wrote one of our own after reviewing every published document on the subject we could find. We believe we have now developed the most effective and comprehensive construction code in the Nation.

There are also areas where no standard is to be found at all. We have, therefore, published one of our own dealing with the extremely hazardous work in confined spaces; another dealing with the protection of extractor equipment; and recently, we have established standards of safety for amateur experimentation with rockets.

Of course, there are national standards which we like so well that we have plagiarized to the extent of photographing the pages. We have done this in the adoption of the American Standard on Abrasive Wheels, which is to be discussed by a member of this panel. We have also done it for woodworking machinery and for the labeling regulations recommended by the Manufacturing Chemists' Association.

One of the exciting things about serving the people through government is the chance to be a part of, to contribute to, the progress of government in improving the quality of its services. We're proud of the modernization and growing professionalization that mark many vital agencies of government, which are moving day-to-day to respond

to the challenge of rapidly shifting community problems. In the area of assuring minimum standards for the physical protection of workers, however, many of the States, including our own, have not moved fast enough. Many States, including New Jersey, in order to exert effective leadership here must enact or amend occupational safety laws to meet current needs. A number of safety statutes still in effect deal with the kind of hazards that troubled Charles Dickens. Their structure is such that they do not authorize the adoption of reasonable standards to meet the hazards that trouble us in 1964. In New Jersey, the updating of our industrial safety laws has been a major effort in the past 4 years. It is an effort that has produced a new explosives safety law, a new and workable construction safety act. We hope it will soon also produce a broad occupational safety law. Proposed legislation has been drafted with the help of management and labor. It is now before the legislature. Its two cardinal features are to require that places of employment be reasonably safe and healthful; and to permit the adoption of detailed standards drawn with the help of those affected by their requirements.

Standards, however carefully drawn and however strictly enforced, cannot by themselves assure freedom from job injuries. Obviously, we must train the man to fit the job, investigate accidents to ferret out causes, build constructive employee attitudes, completely organize for safety. In 1880, New Jersey promulgated its first worker safety standard in law. It prohibited the employment in factories of children under the age of 10. We have come a long way. I hope that we will not now hesitate in the history of our progress in raising the hard-won standards that have made working conditions in America the best in the world.

How Safety Standards Help Industry

C. H. Elsby, *Vice President—Safety and Health Services, Employers Mutuals of Wausau*

I have long been so completely convinced that safety standards help industry in many invaluable ways that I could have spoken on this subject without documenting my beliefs—and done so with absolute conviction. To attempt to operate any kind of enterprise without the use of pertinent safety standards would be, as I see it, akin to voyaging into totally unfamiliar territory without map, compass, or goal; akin to scrapping priceless portions of accumulated human knowledge and experience, and starting from scratch with blind trial and error.

We decided, nevertheless, to obtain documentation on the practical use of safety standards in American industry. We queried all of the

members of the National Safety Council's Industrial Conference, which represents quite a broad cross section of industry, as well as the very backbone of our national economy.

We asked these people, first of all, to what extent they were making use of American safety standards—those developed by American Standards Association procedures, as well as other established safety standards.

The overwhelming majority—in fact, 59 out of the 60 who replied—indicated some usage of safety standards, and a great many indicated quite extensive use. Perhaps the degree of usage is best expressed by the phrase which a number of respondents used: "Safety standard such and such is our bible." Or perhaps reliance on safety standards is best epitomized by J. C. Radcliffe of Ford Motor Co., who said: "Standards are *a way of life* in Ford Motor Co."

In addition to American safety standards, those from other sources that appear to be used quite extensively (and many of these are also accepted ASA standards) are those developed by the National Fire Protection Association, the Underwriters' Laboratories, and various industrial associations such as the Manufacturing Chemists' Association, the American Petroleum Institute, and other industrial and professional organizations. Other standards named, but less commonly, included those established by the American Society of Testing Materials, the American Society of Mechanical Engineers, the National Bureau of Standards, the Atomic Energy Commission, and others.

General Acceptance of Safety Standards

The best way, I believe, to reveal the general acceptance of and the deep appreciation for safety standards, and the keen awareness of their value and usefulness, is to quote some of the remarks of those we queried.

Alan Kling of the Olin Mathieson Chemical Corp. said: "We rely on ASA safety standards because we believe they represent the best guides we can obtain, since they are prepared by a group of people representing a cross section of various interests."

R. R. Donnelley & Sons' Jack Stroube reported: "Without standards, I would be required to investigate and decide upon acceptable standards for a tremendous number of things. It would be an overwhelming task and would require a staff of experts of wide experience."

Robert Albisser of Merck & Co. said that his company would have two major problems if they didn't start with national standards: "First, it would be more difficult to sell various interested people in our organization on the need for incorporating certain design features. Second, it is quite likely that outside agencies would find fault with

our installations and we would have to make expensive alterations . . . . We would be at a loss to operate without standards. Where else could we assemble all the information that goes into the making of a standard? And even if we could, it wouldn't be as authoritative as an American standard."

Rath Packing Company's Howard Rebholz observed that "safety standards serve as an excellent benchmark in making decisions about facilities. They eliminate a lot of guesswork. Many engineers are inclined to use their college textbooks for certain standards—and the older the engineer, the more out of date the standard."

Howard Fawcett of General Electric Co. declared that "G. E. is a large and progressive concern today because of many years of attention to developing and applying standards. . . . While we must vigorously resist standards that become so restrictive they inhibit progress, we warmly welcome performance standards, for they furnish us with a better target at which to aim new ideas and developments. . . . In 1957, a lamp was lit in our laboratories which looks similar to Thomas Edison's first models, which had a life of only a few hours. The expectation is that this lamp will burn at least 100 years. Although you and I will not be around to see if it makes another 93 years, I'm certain that future generations will see the lamp still burning. This is an example of how standards can be a dynamic step to progress if they are considered as something to *excel*, as our knowledge increases, instead of something to be met as cheaply as possible."

A significant number of the respondents gave hearty endorsement to the voluntary, democratic manner in which American safety standards are developed, as some of the remarks I have quoted reflect. To point this up more sharply, I quote Ivan LeGore of the Portland Cement Association, who observes that "the manner in which standards are developed is indicative of the mutuality of interests that lead to practical, time-and-experience-tested standards for universal guidance. There is no more realistic way of answering specific needs."

Frederick Sands of the U.S. Rubber Co. also underlined the point with these remarks: "The approach of ASA to the development of standards is a sound one; the principle of using representatives from industry and associations both in industry and government and insurance provides the kind of knowledge needed to produce such standards; it provides an agreed upon and acceptable consensus. ASA provides us with sensible, down-to-earth, livable standards."

Ted Kraklow of John Deere & Co. summed it up briefly and effectively: "We are better able to sell these standards to our people because we can point out that they were developed on a voluntary basis, by those who had no specific axe to grind."

Specific Uses of Safety Standards

Almost every company queried indicates that they use some safety standards in their entirety, where they apply to their operations. A great many companies use established standards as a benchmark in developing their own company standards to fit their specific needs.

Injury Measurement.—Many of the respondents indicated that they use the ASA Z16.1 as a standard for recording and measuring their accident experience, and thus put their accident experience on a comparative basis with others in their industry.

Construction and Purchasing.—Safety standards are use by quite a number of companies in new construction and remodeling. This is the most effective way to *build* safety into a plant, as G. E. Humphrey of General Motors' Cadillac Division notes: "Standards are very helpful in new installations and department changes, as they require basic safety provisions to be built into the unit rather than a patch-work job after the facility has been turned over to production."

Safety standards are commonly used in the purchase of new materials and equipment, and in the installation of the latter. Representatives of several companies revealed that they make regular use of safety standards in connection with testing procedures they have established for the procurement of equipment and materials.

Authoritative Reference.—The solid authority and wide acceptance behind safety standards works in a variety of beneficial ways, as our survey revealed. Allen Cobb of Eastman Kodak emphasized that "safety standards provide a source of reference to legal bodies concerned with safety enforcement. When changes in codes are proposed, it is very helpful to be able to show that safety standards are available which will provide the necessary safety requirements. This is of great assistance in keeping lawmakers from writing something that is restrictive and ineffective.

Jack Stroube of R. R. Donnelley Co. pointed out that standards "often serve as excellent and irrefutable opinion on proposed regulations that I may have to defend because of the effect the regulations may have on present production methods."

Several of those queried said that they used safety standards as "final authority" in cases of disagreement among their people. One safety director found the ASA ladder code to be extremely helpful in supporting his contention that the company's long-standing ladder specifications should not be altered for reasons of economy—*false* economy, as he saw it.

Variations in State Codes.—Another area in which safety standards serve well is in the case of the multiplant company with operations in many States. As H. Riefenstahl of Alpha Portland Cement Co.

pointed out, "some of the States do not have their own specific codes, and many of these accept ASA standards as their own State codes. We use American standards for reference where specific differences occur between State, Federal, and other codes. We usually take the ASA rather than a less strict State regulation."

Usage by Insurors.—As safety consultants to policyholders, we in the casualty insurance industry find safety standards to be invaluable. Cole Allen of American Mutual Insurance Co. ably voiced the feelings of our industry when he reported: "We feel we must make maximum use of applicable safety standards when we evaluate the adequacy of a special hazard control. I cannot visualize a safety engineer operating without standards."

Cost Reduction.—I'm sure that every company we queried would agree that safety standards save them considerable money, and J. S. Queener of Du Pont is able to point quite specifically to savings achieved. He reports: "Standards help reduce operating cost, contribute to better employee morale and to making a better product. We estimate that every dollar spent on standards brings us a return. In fact, over the past year our reported gross savings has been affected by the various Du Pont technical groups utilizing standards in their cost savings programs."

Guide for New Industry.—Safety standards have particular value for a new industry, because they enable the organizers to build upon the findings of the past. I want to quote Daniel Hayes of the U.S. Atomic Energy Commission, because nuclear energy represents a relatively new industry; thus I consider his remarks to be particularly significant: "ASA safety standards are used extensively as routine management tools in AEC. Many of our installations and regulations applying to the control of reactors and nuclear energy and radioisotopes use, as a basis, the codes adopted and used widely on a voluntary basis by industry. We use ASA standards widely in our contractor-owned plants. Established standards saved us the trouble, money, and time required to write applicable rules. They are useful to us because they are acceptable to industry, having been developed by a process in which industry generally agrees and participates. We may have arguments about 'better than' ASA requirements, but not below them. Standards provide us with an accepted administrative tool generally understood and widely communicated."

Time doesn't permit me to quote the many additional comments from others in American industry, which reveal the inestimable value and usefulness of safety standards. But even though our survey revealed a keen appreciation for the benefits of safety standards, it's safe to say that the benefits are even greater than our respondents—

than any of us fully realize. Why? Because there are now more than 170 American safety standards, and many additional ones, dealing with an infinite variety of things and processes: elevators, building exits, window cleaning, power presses, pressure piping, power trucks, protective clothing, signs, welding operations, to mention merely a few.

Directly and indirectly, safety standards such as these are benefiting industry in many ways—and ofttimes this assistance is so fundamental, so constant, so underlying, so *quietly* effective, that it goes unnoticed. And yet, without this vital assistance, our progress, our profits, our health, our very lives would be placed in jeopardy.

What Standards Mean to Labor

VICTOR E. WHITEHOUSE, *Director of Safety, International Brotherhood of Electrical Workers, AFL–CIO*

To understand the present and to look into the future, it is advisable to open the pages of history and, at least briefly, scan the past. We had better not turn back too many pages or we will find ourselves in a prestandard time that extends back to the beginning of time. It does seem hard to believe in these sixties that in the last sixties, a scant 100 years ago, standards, as we use the word today, were nonexistent.

What were conditions like then? While exact figures are not available, we do know that accidents in industry and construction took more lives and permanently maimed more people than wars and disease together. In shipyard work, only 2 out of 5 apprentices lived to become journeymen, and the life expectancy of journeymen in some crafts was as short as 8 years. Many craftsmen were uninsurable even into the 1900's.

"Man's inhumanity to man" was felt necessary to progress. Industry and construction having spread their wings, and just beginning to realize their potentialities, were rushing hither and yon; making progress—yes—but at the terrifying price of countless arms, legs, eyes, and lives of the workers.

Some of the people finally sickened of the smell of blood and the increasing production costs, so they took a hard, cold look at the situation and began to do something about it.

Progress in the improvement of equipment and conditions was slow but, nevertheless, there was some progress, and then came the infamous "Triangle" fire in New York. This event, probably more than any other single episode in our history, rocked the very foundations of the country. The first shock was replaced by a mixture of emotions:

anger, pity, fear, and apprehension all combined to force on the public conscience of the urgency of improving equipment, conditions, and procedures.

Since then many organizations have worked diligently to develop and promote standards. These sponsors of "standards" and "codes" have been joined by knowledgeable people from manufacturers, users, labor, insurance, government, and the public in an attempt to reduce the tragic toll of accidents. Many States have adopted their "standards" by reference and one cannot but believe that the application of these standards have had a tremendous influence in the reduction of accidents during the past 40 years.

It is labor's hope that the future will see extensive expansion of subject matter covered, constant updating of the standards, and nationwide adoption.

It is indeed unfortunate that, in this day of progress and enlightenment, there are some management groups that not only deny the advantages of adherence to "standards" and "codes" but actually go to the extent of moving their entire operations to areas where they will not be subject to any regulatory codes or standards, and where they can get "*cheap*" labor. According to Webster's dictionary, "cheap" means "worthless, or not worth much; hence, not prized or esteemed." These companies, apparently, haven't changed their thinking since "the year one." They must be educated if we are to continue to reduce the accident toll.

What do standards mean to labor? They mean that the present work force in those areas and plants wherein standards are adhered to are working more safely and under safer work conditions, are having fewer accidents, are more productive, are bringing home larger paychecks, and are able to contribute more fully to all aspects of the community life.

What do standards mean to labor? Even more than the above mentioned things, standards and codes hold out to labor the promise and faith in a future—a future when *all* facets of the American economy can and will join hands to do an even better job in reducing the accident potential throughout the Nation. Standards and codes must play a major role in the American accident prevention program.

How Safety Standards Help Manufacturers of Equipment

J. C. ARNDT, *Product Manager, Simonds Abrasive Company; and Chairman, Safety Committee, Grinding Wheel Institute*

There is little use in blithely assuming that the moral obligation to do so is sufficient reason for industry's adherence to safety standards.

Fortunately for all concerned, selfish economic advantages do accrue to both the worker and the employer when safety standards are followed. Of course, the prime and most important reason for the establishment of safety standards in any industry should be, and is, the protection of the user of the industry's products from physical harm. While industry generally accepts its moral responsibility to protect the users or consumers of its products, the fact remains that its adherence to safety codes is greatly stimulated when such compliance couples economic gain with moral obligation.

One group whose economic welfare is definitely enhanced by safety standards is the manufacturers of equipment, and my part on this particular panel is to discuss "How Safety Standards Help Manufacturers of Equipment."

The two principal pieces of equipment involved in a grinding operation are, of course, the grinding wheel and the grinding machine on which the grinding wheel runs.

Since any help given the grinding machine builders by safety standards will in like manner assist the grinding wheel manufacturers; since it is safe to assume that the help given to the grinding machine manufacturers by safety standards in the abrasive industry is similar to that given by similar standards to equipment manufacturers in general; and since, as a representative of the Grinding Wheel Institute, I can speak with more authority about safety standards in our industry, I have taken the liberty of rephrasing the announced title of this talk to "How Safety Standards Help the Manufacturers of Grinding Machines."

What is this Grinding Wheel Institute and how does it operate? Well, it's an association of 32 member companies engaged in the manufacture of grinding wheels and has as its chief objective the protection and promotion of the best interests of the grinding wheel industry, the users of its products, and of the members of the Institute in every lawful manner.

Its work is carried on by some 14 committees, and two of the most active, if not the two most active, of these are the safety committee and the standards committee. Actually, the work of these two committees is interrelated in the field of grinding wheel safety—so much so, as a matter of fact, to be reminiscent of the words in that old song "Love and Marriage" in that "you can't have one without the other."

The safety committee and the standards committee are intimately involved respectively with this "bible" of the grinding wheel industry—"The American Standard Safety Code for the Use, Care and Protection of Abrasive Wheels, B7-1," and this American Standard Association Code, "American Standard Specifications for Standard

Shapes and Sizes of Grinding Wheels, B74.2." The Grinding Wheel Institute is one of two sponsors of the safety code (the other being the International Association of Governmental Labor Officials) and the sole sponsor of "Standard Shapes and Sizes." In the interest of brevity, I shall in my future remarks, in most cases, refer to these two publications as the "Safety Code" and "Standard Shapes and Sizes," respectively.

The history, scope, and purpose of the "Safety Code" are so admirably told in its "Foreword" that it would be foolish and presumptuous of me to do aught but quote therefrom:

> The safe operation of abrasive wheels requires the understanding cooperation of many diverse groups and of all individuals concerned with their use and operation.
>
> This was recognized as early as 1917 by the grinding wheel manufacturers and the machine tool builders.
>
> Codification and standardization of the basic requirements were formally drafted into a tentative American Standard in 1921. This basic tentative standard was reviewed, revised and published under the auspices of the American Standard Association as the "American Standard Safety Code for the Use, Care and Protection of Abrasive Wheels B7–1" in 1926. This code was revised again in 1930, 1935, 1943, 1947, 1956, and 1964.
>
> The two groups which initiated the code in 1917 have been expanded into a Sectional Committee representing nationally recognized Engineering, Safety, Abrasive Wheels and Grinding Wheel Machine Fabricator and User Associations, Labor Organizations; Underwriter Groups and several interested Governmental Agencies.
>
> Each of these groups recognizing their mutual interests and responsibilities have contributed fully and freely of their diverse experiences for the formulation of this Code for the common good.

That the safety standards established by the "Safety Code" are helpful to everyone engaged in the grinding art, which, of course, include the manufacturers of grinding equipment and machines, I believe will be apparent to you by my merely drawing to your attention the titles of the 10 sections or chapters of the code, which are: Scope and Definitions; Handling, Storage and Inspection; General Machine Conditions; Safety Guards; Flanges; Mounting; Speeds; Special Speeds; General Operating Rules; and Mounted Wheels.

More specifically, however, the "Safety Code" and its able ally, "Standard Shapes and Sizes" are of economic help to the grinding machine builder or manufacturer of equipment, if you will, in four general fields or areas: (1) the area of product liability; (2) the area of machine design; (3) the area of costs; and (4) the field of marketing or sales.

The "Safety Code," in toto, is law in several States, and sections of it are to varying degrees accepted as law in most States. Therefore is it not axiomatic that if a machine builder is sued for damages as a

result of alleged malfunctioning, material deficiency, or poor design resulting in personal and/or property damage, his defense will be strengthened in direct ratio to his conformity with the rules and regulations of the "Safety Code"—particularly those covering general machine conditions, safety guards, flanges and speeds? Successful defenses in product liability cases result, of course, not only to enhance the prestige and integrity of the individual machine builder, but also help keep insurance rates under control, which in turn affects premiums, which in turn affects the price of the product.

The "Safety Code" can be, and in most cases is, a great help to the machine designer and engineer, particularly the designer of new equipment. Rather than drawing on his own limited experience, he has in the "Safety Code" a composite of the varied experiences over many years of many groups involved in the grinding art. For example, he need not wonder about the minimum machine spindles designed to accommodate various diameters and thicknesses of grinding wheels; he need not guess about the proper design and size of machine flanges and collars; and it is not necessary for him to ponder about the configuration, the material and strength of guards. All of these questions, and many more, are answered for him within the pages of the "Safety Code."

Adherence to the provisions of the "Safety Code" can help reduce, or at least help retard, the normal rise of manufacturing costs. If the machine builder accepts the recommendations of the "Safety Code" in such matters as spindle diameters, spindle speeds, material specifications and construction guide for wheel guards, dimensional requirements for flanges or wheel collars, and standard wheel shapes and sizes, it leads to standardization and greater opportunity for mass production in the various parts he needs to buy such as motors, shives, grinding wheels, belts and pulleys—thus making it easier and cheaper to buy and thereby saving the extra cost of specially designed items.

And finally, adherence to the "Safety Code" and to its companion piece, "Standard Wheel Shapes and Sizes," not only helps the equipment manufacturer buy his parts easier and cheaper, but makes it easier for him to sell his products. In most cases buyers of grinding equipment already possess other similar machines. In fact, the new machine may be an updated model of one which the buyer is replacing. Therefore, if the replacement parts including grinding wheels can be standardized to be the same as those used in other machines, the machine buyer will be helped inventorywise, spacewise, and (particularly in the case of grinding wheels, which are usually priced on a quantity-ordered basis), costwise, by the use of more staple products by the equipment manufacturer.

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Yes, safety standards help the manufacturer of equipment. They also help labor and industry in general. But the benefits will not be realized unless the standards are *used.*

Gentlemen, the standards are set up. To make them work for the good of all concerned means only for most of us that we need to exercise a little "sweat."

In conclusion, I would like to remind you that copies of the "American Standard Safety Code" and "Standard Shapes and Sizes," as well as other safety bulletins, can be obtained free of charge by writing to the Grinding Wheel Institute, 2130 Keith Building, Cleveland, Ohio 44115.

WORKSHOP: STIMULATING SAFETY LEADERSHIP IN MANUFACTURING

Moderator: W. G. Johnson, *General Manager, National Safety Council*

The Need for Association Leadership

Jefferson D. Keith, *Managing Director, American Metal Stamping Association, Cleveland, Ohio*

By this title alone, you can easily determine that we immediately have two assumptions: (1) that an accident prevention program per se is needed; and (2) that an association is needed.

Your very presence in Washington this week supports the first assumption. The second is relatively unimportant here today, except to make sure that we are all together on just what an association really is.

If this group is typical of most, there are many who couldn't really define just what a trade association is, or discuss its purposes. I'm not trying to insult the intelligence of anyone present, merely stating facts. Adequate coverage of my topic requires a mutual understanding of the basic concept of trade associations.

Briefly, a trade association is a voluntarily joined, nonprofit organization made up of competing companies operating in the same industry, seeking to accomplish objectives which no single member can accomplish alone. The organization for which I work represents companies in the metal stamping industry. This industry generally is considered a "small business" industry. Members of the American Metal Stamping Association range in size from 5 employees to 2,500—the average being about 50 employees. To many of you in the audience, that is really small. Regardless of this, however, experience with some of the "giants" of industry has shown the problems, accomplishments, and needs to be similar.

Actually, there are several reasons we could give for a categorical answer of "yes" to the question "Is there a need for association leadership?" Chief among these reasons is that there are some 2,200 national trade associations currently in existence and, as far as we can determine, about 80 percent of them have some sort of an accident-prevention program. Since the basic program of activity for these organizations is determined by the members themselves, we could

F. G. Stephenson, Manufacturing Chemists' Association, Inc. (at lectern) leads panel in discussion of the role of a trade association in promoting safety in the manufacture, handling, and use of its products.

say that such a program is not only needed, it is demanded. There are other supporting reasons, but let's get into some facts which I believe point out the need vividly.

This association's accident prevention program was begun in 1952. Despite an obvious need for such a project, it was, more or less, forced upon the members by threatened legislation and increasingly rigid standards by various States.

At the outset, it was obvious that these companies had been doing some work in the area—many were collecting data on accidents—but their accomplishments were negligible—borne out by their own statistics. Fortunately, records were sufficient to give a good sample of the "before" status.

It is my intention now to coordinate the development and operation of the association program with the frequency of our member companies participating in it.

As near as we can determine, the overall frequency of members for the year prior to our start and during the year of development was 14.2.

The following 3 years show considerable success, resulting from the efforts of many people. After initial publicity about plans for a program, the first major project was the development of a handbook on accident prevention. This was called "AMSA's Keys to Safety."

If you have ever made an attempt to corral the thoughts of several hundred people into a compact handbook, you know the problems involved. Contributions of data for this project provided a good indication of the great amount of interest the association aroused.

As sections of the handbook were completed, they were circulated to members. Those sufficiently interested could develop their own program as the association was compiling the handbook. The chapters in this book are:

I. Organizing a Company for Safety
II. Establishing Safety Rules
III. Training for Foremen and Supervisors
IV. Group Training or Employee Training
V. On the Job Training
VI. Housekeeping
VII. First Aid
VIII. Safety Devices and Equipment
IX. Accident Reporting and Statistics

The procedure used in compiling this data insured a constant awareness by members of the work being done and the problems to be solved.

During the period the handbook was being developed, regularly scheduled bulletins with worthwhile data were being distributed.

These called attention to the vast problem facing metal stampers and pointed to the cost—the obvious and the hidden—of accidents. In addition, safety or accident prevention received attention at national meetings through formal presentations. A full day of the annual technical meeting was devoted to safety topics. During the first 2 or 3 years, some of these were: Top Management's Place in Safety; Safety as a Productivity Factor; Save Money with a Sound Safety Program; Accidents Ain't Accidents; Die Safety and Its Application; Safety at the Press; Designing Safety Into Dies; and Power Presses and Safety Problems.

A lot of people worked very hard during the first several years. There was tremendous enthusiasm. Management was really striving to win the association's safety certificate. The results showed in our safety statistics.

From the 14.2 in 1952, the frequency rate of AMSA members went down to 12.2 in 1953; 12.0 in 1954; and 11.4 in 1955.

From this, it was obvious we were making headway with still much room for improvement. Continued work on the handbook—involving as many people as possible—along with more discussions of the main problem areas at national and district meetings reduced the frequency even further to 11.2 in 1956, and 11.0 in 1957.

Some topics covered at meetings during this period were: An Engineering Approach to Safety; The Press Operator Learns His ABC's; Safety Doesn't Cost—It Pays; Safety Programs Which Have Worked; Safety Swap Shop; Knowing's Not Enough; and Large Press Guarding.

Frequent publicity of accomplishments of others and constant reminders of industry's need generally maintained the initial enthusiasm.

With the completion and wide distribution of the *Keys to Safety Handbook* and consultant service from the national office, great strides were made in the next 2 years; 9.8 in 1958, and 8.0 in 1959 gave AMSA its alltime low frequency.

Even with this favorable result, enthusiasm begins to wane after 6 years of almost constant attention and continuous hounding on the subject.

Members began to report that we should lay off safety for a while. Frankly, the staff was ready to devote attention to other areas.

Presentations on accident prevention topics were shunted aside. The number of safety bulletins was reduced. Except for awarding the Safety Certificates, there was little attention given to the subject at the technical meeting. The results were: in 1960, a frequency of 9.6; and in 1961, a 10.3. This was sufficient to arouse some concern and we were again able to direct some effort to safety, but not in time to prevent a further climb to 10.9 in 1962.

We returned to the full day session on safety at the annual technical meeting, with topics such as: A Practical Approach to Your Safety Program; Safety Swap Shop; Noise Control; and Accident Reduction Through Proper Lighting.

Safety bulletins were increased. The safety committee was revitalized by the appointment of younger, aggressive men. Efforts were renewed to publicize almost unbelievable reductions in insurance premiums as a result of an improved safety record. Increased participation by association representatives in other safety organizations provided much helpful information.

By 1963, the frequency was down to 10.5, and the organization is determined to maintain this downward trend.

A close look at these figures has shown the effect of deemphasis on accident prevention. This is something that few management people pursue on their own initiative. They must be constantly prodded. No one is better equipped to do the prodding than a trade association—unless, of course, it's the insurance company.

The statistics already referred to show that a group, without leadership, was doing nothing. Once organized, possibility of success was clearly evident. The reversal of a favorable trend as a result of reduced attention shows the urgency of constant emphasis.

Let's look at some other statistics that show the importance of association leadership. The frequencies discussed previously reflect the safety record of member companies that have participated in the program since its beginning in 1952. The frequencies of another group of companies are interesting. These seven companies were members of the association at the start of the program and participated. For various reasons, they resigned during this period, but rejoined in 1962.

The frequency for these seven companies in 1954, the first year when all were participating, was 16.4, far above the frequency of all member companies. Their improvement exceeded the overall group and, at the end of 1958, before any of them resigned, their frequency was 9.4.

You'll recall that business in 1958 and 1959 was lousy and profits were even worse. As is usual in such times, many people forget all the good things that come from trade associations and choose to go their own way. So the seven companies we're discussing, along with some others, resigned.

Some of these companies were only away from AMSA for a year or so, and all were back by the end of 1961. The reports for these companies showed they had gone up to 14.8. At the end of 1963, they were back below the total group with a 10.1.

Naturally, there are many things to influence a company's frequency rate. It's possible that activities of the trade association played only a minor role in the accomplishments. However, there are many factors, not to be discussed here, which convince us that the leadership provided by the association is vital to success by individual companies.

Let's consider one other group of member companies to illustrate the need for and value of association leadership. During 1963, AMSA took in 37 new members. Twenty-five of them participated in the accident prevention program. Their frequency was 24.3. A large majority of these companies gave as their major reason for joining . . . their desire to get assistance on a much needed program of accident prevention. Their interest and participation points to real improvement in 1964. Although time did not permit a thorough study of statistics from other associations, brief review indicates that many others can authentically support similar findings in their own industry.

If you still doubt the need for association safety programs and wonder about the value of it, think for a moment about your own company's program. The chances are that your program results from, and is strongly influenced by, an aggressive trade organization. The very cooperative nature of the trade association makes it the ideal leader for such a program. If you haven't taken advantage of what the association in your own industry can offer, you are missing out on a sure thing.

Key Men—Another Tool

Allen H. Watts, *Safety Director,*

Union Bag-Camp Paper Corporation, Savannah, Ga.

The story I have to tell you is a simple story; in fact, a very simple story. At a time like this, and especially in a place like this, when the emphasis seems to be on the complexities of the business rather than on its simplicities, when the more scientific of our kind tend to apply the intricacies of their sciences to the simplicities of the problem, my story seems even more simple.

My story concerns a group of workers who accepted the challenging assignment of preventing accidents and injuries in their ranks—among their fellow workers—to a degree their intellectual and organizational superiors had not been able to attain; to an extent never before accomplished. It is the story of a group of men who accepted a tough, new, and different chore, and worked it out to a successful conclusion.

For my story to have much meaning, you would have to know something about the background in which it was conceived, born, nurtured, and developed; something about our industry; something about our company. I represent the paper industry.

My company is not the largest company in our industry, but we have the distinction of operating the largest, single manufacturing-converting complex of its kind in the world. We harvest trees, extract the wood fiber, add chemicals, and make paper from it. We convert the paper into bags in one activity and into boxes in another. We process our byproducts in a chemical manufacturing activity; generate our own power; maintain our own equipment—heavy and light; do our own engineering, accounting, and research.

If this pinhead description describes a complex, dangerous operation, it is accurate in spite of its brevity. It produces more than its share of hazards, but is nevertheless a typical American industry. We have 5,000 plus employees—all smart people, but some with more brains than many, and many with more brawn than some. Again—a typical situation. We have a forward thinking, forward acting management that provides every operating assist known to good industrial relations—including an accident-prevention group and a training group.

During the period around 1950, our accident prevention group reported our accident experience as being "below average"; which is to say "among the poor, it was pretty good," but "among the good, it was pretty poor."

Our training group had the opinion that our supervisors needed safety training. Accident prevention and training joined forces and gave our supervisory force safety training—all kinds: basic and advanced safety; training in the humanities of the business; training in the cost of the business; training in the psychology, physiology, and philosophy of the business; training in anything you can mention relative to safety.

Then, with what must have been one of the best safety trained supervisory groups in the business, we sat back and took stock. There was "some improvement!" There was not enough improvement! We improved from "below average" to about "average." Improvement that was not commensurate with the effort expended. Something was still wrong! Management became impatient; workers remained complacent; supervisors continued as the safest group in the organization. The accident prevention and training group were disappointed, but inquisitive—still looking for what was wrong.

Then we found what we thought was the trouble. "We had trained a supervisory group that did not supervise." The discovery was about as embarrassing as it was revealing. We don't mean by this that our

supervisors did not do their jobs. We do mean, however, that their jobs did not require, or even permit, the kind of supervision that would effectively prevent accidents and injuries. Now, if this situation of supervisors who do good jobs but don't effectively supervise is confusing, let's use an analogy to explain. Let's take the oldtime *labor foreman.* He was the fellow with the broadest shoulders, strongest back, most powerful biceps, loudest lungs, and the most profane vocabulary. He took a commanding position over his charges as a mother hen over her biddies. He urged them to greater, more continuous, and more productive efforts in various ways but always in such ways as would result in safe performances. His constant observation, his knowledge of the job, and his never ending "don't do this, don't do that" and "do this, do that" got the job done safely.

As we progressed in industry, this fellow gave way to the supervisor of today—the fellow who plans his production, checks results, investigates complaints, watches quality, figures costs, writes safety rules, attends meetings, plus a thousand other things. He has a slide rule in his shirt pocket, safety shoes on his feet, a green cross for safety badge on his belt, and maybe, he even has a hard hat on his head. He has assistants too, but, in most cases, none of them provide the kind of supervision the labor foreman did.

While the old boss is gone, his equivalent is still here. He is the fellow who has a little more on the ball than his fellows, sees a little further, and stands a little taller than the rest. Because of this, he has earned and occupies the unofficial position of leadership. In our industry, he is known by various names: Pusher, Lead Man, Head Man, Adjuster, Operator, Top Hand, etc. His counterpart exists in your industry and he is known by a similar or different name but, he is there. He is present in every group. He knows the details of the job intimately; he is skilled in the handling of his associates; he has been accepted by them; he is constantly with them; he is in an ideal position for safety leadership—but he is *untrained in safety matters.*

Our error was not in the kind of training we provided, nor in those we provided it for, but that we quit too soon. Ours was an error of "limited objective." We needed to train these unofficial leaders in accident-prevention techniques and use them in the accident-prevention effort.

At this point I, perhaps, should mention that the effort to utilize this group of workers to prevent accidents and injuries was not in place of any part of the well balanced accident-prevention program that's been at work in our plant for years, but rather an addition to it.

Management approval of our plan was necessary. Management had reservations and questions concerning how these unofficial leaders

would react to such a situation: Would they properly use, and not abuse, the authority they would need to be effective? Could they assimilate the training that was necessary? Would they continue to be content in their present jobs? Would they clamor for higher rates and for official job status? How much would it cost? How could this approach be handled so as not to abrogate the supervisor's responsibility for the safety of his people? How would the plan affect the working relationship between supervisors and these key men? All adding up to one big question: Can it be done successfully? The answer had to be found, so we devised—

The Plan

Place.—We selected one of our major operating divisions as the place to start.

People.—To involve all people, we asked the division manager to handle the opening meeting. To keep supervision involved, we asked each department to contribute a top supervisor to a cadre of instructors. All departments were represented—the operating, maintenance, and service departments. Their top operators, leadmen, first hands, and technicians were the trainees. We called them what they were to us at the moment and what we hoped they would be to the overall program in the future, "*key men.*"

Grouping.—To simplify the problem—giving it proportions of "*sameness*"—we mixed all the people on a shift into a group, regardless of their department or background, resulting in four groups.

Instructors.—To give the approach the simplicity of *oneness*, we used any supervisor from the cadre with any group.

Time.—Because of the number and nature of the duties of our key men, all meetings were held on overtime, with all participants receiving premium pay. Meetings lasted one hour and were held every 4 weeks.

Our organization was designed to impress all concerned that there was but one basic problem, regardless of departmental orientation; that the answers could be effective, coming from any individual, going to any group, provided they were the right answers.

Agenda.—The first meeting was "organizational" and "instructive," with emphasis on the latter. We provided a philosophy which established the need for a formal approach to the problem, plus very little basic safety. In the second meeting, we asked the key men to place themselves in the position of management in a plant that was having a bad accident experience. How would they handle the problem? What would they do? In subsequent meetings, we covered subjects they were interested in: accident cost, frequency, severity,

compensation benefits, statistical comparisons, accident analysis, reporting, emergency handling of seriously injured persons, fire safety, home safety, safety leadership, etc. Now we have a small library of lesson plans covering the many subjects we handled.

Results

During the period 1950–60, the disabling injury plant frequency wavered around 6.10—up a little, down a little—with no significant change. We had reached a "plateau." Some of the experts describe this situation as "the point of diminishing return," "the irreducible minimum," "the point beyond which you probably cannot progress."

We started our key man program early in 1961. We had 160 key men (8 percent of total work force) from our most hazardous division attending these training sessions and helping with the problem. At the end of the year, the plant frequency was 4.78. The national average for the industry was 7.39. We had improved 21 percent over our 10 year average; the *first significant change* for the better in years.

During 1962, we started a key man activity in our second largest division. This activity involved 175 key men (9 percent of the total work force). At the end of the year, the plant frequency was 2.90. The national average for the industry was 7.21. We had improved another 39 percent while the industry had improved only slightly.

During 1963, we started a third key man group of 40 people in our third most hazardous division (11 percent). At the end of 1963, our plant frequency was 2.15, an additional improvement of 26 percent. The industry figure was 6.71.

We used the key man plan in our trouble areas—manufacturing and converting. Our total improvement for 1961 through 1963 was a 65-percent reduction in disabling injury frequency.

Our frequency to date for 1964 is 1.87.

We don't believe this is a matter of luck or even coincidence. Our improvement ties in too closely with the development and application of the key man program, for there to be any doubt as to the cause of our improvement. Nor have we been content to measure our progress with the single yardstick of "frequency."

Severity figures showed improvement. Our 1962 severity rates reached an all-time low of 166.48.

Recognizing, too, that figures can be so used as to prove or disprove almost anything, we applied the most critical yardstick of all—our accident cost to the business and the picture remained good. During our "average" years, compensation and medical expenses were approximately $20 per person per year. In 1961, they were $15 per per-

son. In 1962, they were $6 per person. In 1963, they jumped up to $9 per person.

Records

As further evidence of our accomplishments, we established numerous records: On three different occasions the entire plant operated 1 million hours without a disabling injury. A major converting division has done this twice plus two other cycles of 2 million hours without a disabling injury. Another converting group accomplished 1 million hours and is well into its second consecutive year without a disabling injury. These and others have been recognized by our State Department of Labor, the Technical Associations of our industry, as well as the National Safety Council. All of these records were established after our key man safety training program went into effect.

All has not been roses or, if it seems so, the roses had some thorns—during 1963, a man was killed.

We don't kid ourselves about the future. Mistakes both mechanical and human will be made. There will be accidents. People will be injured; some will be disabled; occasionally a person will be killed. The statistics guarantee this. Possibly by now we have reached "the point of diminishing return," "the irreducible minimum," "the point beyond which it is impractical to go," "the acceptable plateau." Our key men will accept the humanitarian viewpoint and reject the statistical one. As long as accidents injure our people, our key men will be doing those things best calculated to prevent accidents, all of them. Even if we can't improve, it will still take a lot of effort on everyone's part to stay where we are.

Where do we go from here? To the home, the highway, the community! The field is unlimited, the need is great.

Byproducts

Then like all good processes there are byproducts. There is a competition between supervisors and key men that is healthy. There is also the thought that these same key men can unlock the doors to other problem areas: waste, quality, cost, etc.

People

What kind of people are our key people? Very normal people—possibly very ordinary people to start with, but not ordinary any longer. They are the same kind of people who work in your plant. Now as my time runs out, I would like to correct a statement I made several times. I referred to this as "my story." Obviously, it is "their story."

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Summary

I would summarize this story this way: Our key man program utilized a group of "natural leaders" to bridge a gap in our vital communications line. Safety communications started at the top, went down through the supervisory level, never quite reaching the workers who were getting hurt. Now the gap is closed. Communications go all the way from top to bottom—and back to the top.

Our key men did a fine job for us. Your key men can do just as fine a job for you. Our key man safety program was the "breakthrough" for us.

* * *

[The program of this workshop also included a panel discussion: "What an Industry Trade Association Can Do To Promote Safety in the Manufacture, Handling, and Use of Its Products." The statements were brief and informal. The discussion was led by F. G. Stephenson, Secretary, Safety and Fire Protection Committee, Manufacturing Chemists' Association, Inc. Panelists were: George L. Gorbell, Manager, Safety and Fire Protection, Monsanto Company; S. F. Spence, Director, Safety and Loss Prevention, American Cyanamid Company; Glenn G. Fleming, Director of Safety and Plant Protection, Celanese Corporation of America; R. H. Albisser, Corporate Safety Coordinator, Merck and Company, Inc.; and A. H. Christian, Corporate Safety Engineer, FMC Corporation, American Viscose Division.]

APPENDIX I, II, III

APPENDIX I

Geographical Distribution of Delegates Attending the 1964 President's Conference on Occupational Safety

Alabama	15
Alaska	2
Arizona	3
Arkansas	8
California	88
Colorado	17
Connecticut	39
Delaware	28
District of Columbia	885
Florida	55
Georgia	25
Hawaii	7
Idaho	11
Illinois	149
Indiana	36
Iowa	17
Kansas	10
Kentucky	20
Louisiana	18
Maine	7
Maryland	180
Massachusetts	46
Michigan	69
Minnesota	17
Mississippi	7
Missouri	43
Montana	2
Nebraska	12
Nevada	4
New Hampshire	5
New Jersey	76
New Mexico	11
New York	303
North Carolina	41
North Dakota	1
Ohio	123
Oklahoma	17
Oregon	7
Pennsylvania	151
Puerto Rico	6
Rhode Island	10
South Carolina	21
South Dakota	4
Tennessee	36
Texas	62
Utah	6
Vermont	1
Virginia	105
Washington	19
West Virginia	24
Wisconsin	35
Wyoming	3
Foreign:	
Canada	5
England	2
Switzerland	1
U.A.R.	1
Total	2, 896

APPENDIX II

Representation of Delegates Attending the 1964 President's Conference on Occupational Safety

Industry	831
Labor	345
Government	1,043
Insurance	78
Medical*	166
Agriculture*	21
Education*	105
Safety Councils	32
Trade and Professional Associations	209
Other	66
Total Conference Attendance	2,896

Breakdown of Government Attendance

Federal		773
Safety	381	
Medical	75	
Education	15	
Agriculture	32	
Other	270	
State		185
Safety	50	
Medical	22	
Education	19	
Agriculture	8	
Other	86	
County		17
Safety	5	
Medical	1	
Education	8	
Agriculture	0	
Other	3	
City		68
Safety	34	
Medical	3	
Education	12	
Agriculture	0	
Other	19	

*Non-Government. Refer also to "Breakdown of Government Attendance."

APPENDIX III

ORGANIZATION OF THE 1964 PRESIDENT'S CONFERENCE ON OCCUPATIONAL SAFETY

General Chairman: W. WILLARD WIRTZ, Secretary of Labor

General Vice Chairman: MRS. ESTHER PETERSON, Assistant Secretary of Labor for Labor Standards

Executive Director: REED O. HUNT, Chairman of the Board, Crown Zellerbach Corporation

Chairman, Program Planning: LEO TEPLOW, Assistant Vice President, American Iron and Steel Institute

Vice Chairman, Program Planning: HUNTER P. WHARTON, General President, International Union of Operating Engineers

Staff Services: Direction by ARTHUR W. MOTLEY, Director, and GEORGE T. BROWN, Deputy Director, Bureau of Labor Standards, U.S. Department of Labor

ADVISORY COMMITTEE

ABERCROMBIE, S. A., Assistant Executive Secretary, Commission on Safety Education, National Education Association

AHEARN, VINCENT P., Managing Director, National Sand and Gravel Association

AINSWORTH, CYRIL, Deputy Managing Director, American Standards Association, Inc.

BOWLER, EARL, M., Division of Vocational and Technical Education, Office of Education, U.S. Department of Health, Education, and Welfare.

*BRODY, DR. LEON, Director of Research, Center for Safety Education, New York University

CATHERWOOD, MARTIN P., Industrial Commissioner, New York State Department of Labor

Alternate: CARL J. MATTEI, Director, Division of Industrial Safety Service

CLAGUE, EWAN, Commissioner of Labor Statistics, U.S. Department of Labor

Alternate: FRANK S. MCELROY, Chief, Division of Industrial Hazards

*CONNORS, JOHN, Executive Secretary, AFL–CIO Standing Committee on Safety and Occupational Health

COUTTS, C. A., Director of Safety, Northern States Power Company (representing Edison Electric Institute)

DEEG, F. H., Manager, Accident and Fire Prevention Department, National Association of Mutual Casualty Companies.

DORAN, DR. WILLIAM, JR., U.S. Atomic Energy Commission (representing Industrial Medical Association)

DUNLOP, JAMES D., Director, Manpower Activities, Industrial Relations Division, National Association of Manufacturers

*FERGUSON, R. H., Assistant Director of Industrial Relations, Republic Steel Corporation

*Member, Program Planning Committee.

*FORD, B. ALFRED, Sanitary Engineer, Federal Products Corporation

GILDEN, ROBERT O., Agricultral Engineer, Federal Extension Service, U.S. Department of Agriculture

GRIMES, S. W., Managing Director, Pacific Coast Association of Pulp and Paper Manufacturers

GRITTA, B. A., President, Metal Trades Department, AFL–CIO

*HAGOPIAN, ROBERT, Assistant Manager, Accident Prevention Department, Association of Casualty and Surety Companies

*HARDIN, IRA H., President, Ira H. Hardin Company (representing Associated General Contractors of America)

Alternate: ARTHUR L. SCHMUHL, Safety Director, Associated General Contractors of America

*HAYES, DANIEL F., Chief, Safety and Fire Protection, U.S. Atomic Energy Commission

*HOEFFER, BRIG. GEN. HENRY J. (Ret.), Assistant General Manager, National Safety Council

HOEKSTRA, EDWARD, Executive Secretary, National Constructors' Association

HOWE, HENRY F., M.D., Secretary, Council on Occupational Health, American Medical Association

KUSNETZ, HOWARD L., Division of Occupational Health, Public Health Service, U.S. Department of Health, Education, and Welfare (representing American Conference of Governmental Industrial Hygienists, and Public Health Service)

LANDRY, EDWARD B., Director of Safety and Health, U.S. Post Office Department

LANE, HAROLD E., Vice President, Labor Relations and Personnel, Sheraton Corporation of America (representing American Hotel Association)

LEHR, EUGENE, Division of Accident Prevention, Public Health Service, U.S. Department of Health, Education, and Welfare

LONGHURST, H. R., Assistant Director, Bureau of Safety and Service, U.S. Interstate Commerce Commission

LOUGHERY, RICHARD M., Washington Hospital Center (representing American Hospital Association)

LYNCH, DR. JOHN M., National Institutes of Health, Public Health Service, U.S. Department of Health, Education, and Welfare (representing American Academy of Occupational Medicine)

Alternate: DR. LAWRENCE A. PYLE, JR., Chesapeake and Potomac Telephone Companies

*MALE, RAYMOND F., Commissioner, New Jersey Department of Labor and Industry

Alternate: RICHARD J. SULLIVAN, Administrator, Bureau of Engineering and Safety

*MANDL, DR. HAROLD J., Division of Industrial Mental Health, The Menninger Foundation

MCCAULEY, GEORGE D., Safety and Health Officer, National Aeronautics and Space Administration (representing NASA and Federal Safety Council)

MCDONALD, DAVID J., President, United Steelworkers of America, AFL–CIO

MCSORLEY, WILLIAM J., JR., Assistant to the President, Building and Construction Trades Department, AFL–CIO

MORRISON, GEORGE E., Manager, Insurance Department, Chamber of Commerce of the United States

*Member, Program Planning Committee.

*Murphy, Mrs. Anne, R.N., Corporate Staff Nurse, Medical Services Department, Scott Paper Company (representing American Association of Industrial Nurses)

Palmiter, Claire C., Special Assistant, Federal Radiation Council (representing Health Physics Society)

Queener, J. Sharp, Manager, Safety and Fire Protection Division, E. I. du Pont de Nemours & Company (representing National Fire Protection Association)

Snyder, Calvin K., Executive Vice President, American Retail Federation

Stephenson, F. G., Secretary, General Safety Committee, Manufacturing Chemists' Association, Inc.

Swisher, Elwood D., Vice President, Oil, Chemical and Atomic Workers International Union, AFL–CIO

*Van Namee, James F., Vice President, East Central Region, American Society of Safety Engineers; Westinghouse Electric Corporation (representing American Society of Safety Engineers)

Walsh, Richard F., Vice President, AFL–CIO, and Chairman, Committee on Safety and Occupational Health

Webb, Ernest B., Director, California Department of Industrial Relations

Wilkenson, Thomas, Safety Director, U.S. Department of the Army (representing Department of Defense)

Wocholski, Leonard B., Chairman, Safety Standards Committee, American Society of Mechanical Engineers; General Motors Corporation (representing American Society of Mechanical Engineers)

*Member, Program Planning Committee.

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